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ORIGINAL ARTICLES

PRESIDENT'S ADDRESS*

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OUR gathering today in Atlanta, from the four corners of North America, exemplifies a twofold purpose. You have come with the idea of acquiring and of disseminating orthodontic knowledge.

The archives of this organization, founded in 1901, will disclose the fact that this is the first time in its history that this section of the nation has been honored with this privilege. The reason for this is quite apparent if we recall the status of orthodontia in the Southern States a few years ago. In 1912 there were less than five dentists representing our specialty. Today there are two organized bodies, The Southern Society and The Southwestern Society, both functioning in accord with and in dignified supplication to the American Society of Orthodontists. Their total membership aggregates the surprising number of ninety.

This society, the parent body of orthodontia in America, should receive full credit for its influence in, first, stimulating members of the dental profession to enter this particular field of study and, second in demonstrating the value of organization.

THE PRESENT STATUS OF ORTHODONTIA AND ITS FUTURE AVENUES OF DEVELOPMENT

In retrospection, the older members of this society can testify to the mechanical avenues of orthodontic evolution. They will remember controversies which were almost entirely devoted to the merits of a jackscrew or

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spring force; the properties of a clamp-band versus a seam-band; the advantages of a "removable" appliance as compared to that of a "fixed" appliance, etc. Due credit should be given to those men who shared in the development of the mechanical phase of orthodontics, but it is my unqualified belief that we have reached a point of orthodontic procedure and study when our vision should broaden. We should not pin our faith to mechanics. It seems to me that we have at our disposal every necessary device to meet the requirements of local disturbances, and my plea is for a research that will link us with that type of scientist who acknowledges no one part of the human body as paramount.

Medicine, and we are very definitely a part of medicine (or should be), is unlike law, in that law is practiced almost entirely by precedent. By this I mean that one important case decided by a Supreme Court may be the basis and argument for the decision of hundreds of others. This is not true in medicine in the broad sense. The human organism is like the flakes of snow—all alike, yet different. There is an "individual normal" in human beings that does not apply to legal procedure and this "individual normal" is the gateway to medical crypticism. Medicine, years ago, functioned through eyes covered with smoked glasses because it was without the means of diagnosis. Medicine, therefore, has advanced only as the diagnostic ability of medical men has been increased. Even now, when the pseudonym of "modern medicine" is assumed, it is acknowledged that the surface has been only scratched. However, by scratching the surface, specialization has progressed into a state of harmony and cooperation, so that a specialist in one branch seeks the opinion and advice of others. This sort of cooperation has given a field so broad that study is unlimited.

There is always an opportunity offered to any individual, business, or profession to progress, and we are very definitely interested in advancing orthodontia through diagnostic lines. This must necessarily be done through correlating the development of the mouth with other parts of the body. Other branches of medicine combine their efforts and study to help one another.

Our classifications of malocclusions, in their present status, make it self-evident that the confines of orthodontic conception are locally limited. Those students and workers who will persist in a worship of the "forces of occlusion" will some day be educated to the fact that these factors are not to be charged with mouth development per se. When, in the searching light of investigation, we meet with mouth condition with normal occlusion, accompanied by receding chin and a definite underdeveloped mandible, then our predicated faith in the potency of the "forces of occlusion" is shaken to its very foundation. In the type of case classified as Class II, Division 1 (Angle), which incorporates, as a part of its definition, the words "always associated with mouth breathing," we are taught that the displacement of the tongue and lips, together with abnormal muscular pull, produces a similar malocclusion and maldevelopment. When a definite, prolonged mouth-breather presents a normal occlusion, a normal arch and jaw development, the prob-

lem of to what extent local factors influence the growth of the jaws and associate parts naturally confronts us.

When we see a mouth with as many as twenty-three (23) absent teeth (pre or postnatal), and that mouth presents arches normal in width and relationship, are we thorough in our work and research if we continue to charge this responsibility to the "forces of occlusion?"

In mesiooccluding cases (Class III, Angle), we are taught that the exciting cause is the enlargement of the faucal tonsils which produces a desire to first voluntarily and then involuntarily carry the mandible forward. In a very short time its anterior displacement is established through the locking of the cusps of the teeth. Yet, when we follow the natural avenue of restoring these cases to normal, it is occasionally found that every orthodontic means fails in its object.

In the very simplest neutrooccluding case (Class I, Angle), where arch width is insufficient to accommodate the permanent incisors, I know of no explanation for nature's deficiency. In these cases, so inobtrusive in appearance, we might appease our conscience, because of lack of diagnostic ability, by explaining the influence of an artificially fed baby, an inefficient mastication or impaired muscular pull, etc. But do these hypothetical, causative reasons actually prove the responsibility of width deficiency? By adopting a plan of "watchful waiting" in a youth of seven to ten or even twelve years of age, many of such conditions unfold and finally present normal arches and normal occlusion. A routine of "early treatment" in all cases presenting malocclusion might be construed as inexperience or poor judgment.

Only a short time ago your presiding officer was discussing our problems with a medical man of no mean intelligence who began to inquire into our diagnostic acumen. After a rather painstaking expose of our causes and effects, we were asked the direct question, "Do you consider the oral cavity and immediate structures as correlated with general developmental changes?" My reply, though without actual evidence, was in the affirmative.

The challenge was then given that no scientific branch of medicine, and certainly we covet this distinction, can accurately function on the human organism, either in diagnosis or treatment, without a knowledge of the fundamental principles, at least, of other branches. This may seem to you a broad, and possibly bizarre statement, but it does not mean that we, as orthodontists, should be doctors of medicine when we have at our disposal the willing and helpful hand of every medical man in America who is interested in research.

RECOMMENDATIONS

In reading the constitution and by-laws in an attempt to analyze the exact meaning of every article, it seems to me that this document is in need of "repairs." The construction of certain articles makes them both vague and ambiguous. I would recommend that the succeeding Executive Committee, the President acting as Chairman, be instructed to offer at the next annual meeting such changes as they shall deem sufficient to rectify the present unsatisfactory method of government. We have outgrown the original form

adopted when we were organized, irrespective of the several changes that have already been made.

It is further recommended that a committee be appointed to investigate the feasibility of coordinating the various orthodontic societies of North America with the American Society of Orthodontists. The arrangement to be similar to that existing between the State Dental Societies and the American Dental Association. This committee to report at the 1926 annual meeting.

In closing, I wish to express my appreciation to those who have so unselfishly worked, during my administration, to make this meeting an outstanding success.

DISCUSSION

Dr. P. M. Casto.—I cannot with propriety permit this opportunity to pass without expressing briefly the sentiments attached to this meeting, and I shall not ask your permission to do so, neither shall I offer an apology for the digression. I do, however, hope to elicit your indulgence.

It is quite fitting and proper indeed, that this, the twenty-fourth annual meeting of The American Society of Orthodontists should be held in Atlanta. The reasons are obvious. A city of culture, refinement, wealth and beauty, possessed of all those elements and advantages which make for advancement in Art, in Literature, in Science, in Education, a city of great commercial importance, progressive and sound, and because of its strategic location and the inherent qualities of its people, is destined to become the Metropolis of the South and one of the great centers of the County. The South, a country of Sunshine and Romance and Inspiration, imbued with sentiment, favored with immortal traditions and possessed of unpretentious though incomparable dignity. A people endowed with God's finest and kindliest gifts, they are charitable, gracious, benevolent and sympathetic, yet strong, courageous, confident and sincere. From these qualities there exuberates a profusion of characteristics, the foremost of which are hospitality, courteousness, forebearance and personality. Then our president, in whom we have the utmost confidence and for whose sterling and inherent qualities we have the most profound respect, his unwearied enthusiasm, implacable fervor and throbbing personality is a joy and inspiration to all who know him.

In consideration of all these things, together with a most cordial invitation from the Southern Boys to come and partake of their generous, delightful and unadulterated hospitality, I ask you could any man have the temerity or audacity to decline, and so it is most fitting and proper that we are here, and I wish to thank our worthy president and his associates for the invitation to come, for the entertainment and hospitality that will be accorded us.

Quite aside from these things, we are here for still another purpose. The Board of Censors has provided a superlative program, which will be interesting, instructive and beneficial to all of us. We will see, hear, learn and be inspired, the end-result of which will make for better men, better orthodontists and better service to humanity. Now your forbearance is asked while a few comments are made on the president's address, the pleasant duty which I was invited to perform. In deference to the members of the society, be informed that I did not accept this responsibility without some trepidation and fear. I could not conjure the thought as to what the president had up his sleeve. The invitation was received by telegraph, and being rather a cautious and timid person, I hesitated for more than thirty minutes before having the audacity to reply in the affirmative. Therefore, the responsibility for the effrontery, if such, must be assumed by some one, other than myself. I enjoyed reading the address and pondering over the various phases of it, but have enjoyed his presentation of it more. The important points have been emphasized and their values enhanced. A copy of the address has been in my possession for several days, for which favor, Dr. Howard is to be thanked and given due credit. It was so different than is the usual custom. In a broader sense—I am in

accord with the views expressed. One might fail to interpret or understand the vision that Dr. Howard has for the future progress and advancement of the Science of Orthodontia if his thoughts were confined to the illustrations used. The study and practice of Orthodontics has broken away from the confines of Mechanics—lo—these many years. It is perfectly obvious, however, that the use and study of appliances can never be divorced from the practice of corrective orthodontics. They are just as much an integral and necessary part of orthodontia as replacement work is of dentistry or suturing is of surgery. We should not be criticized or condemned, but rather commended for the progressive evolution made in the construction and use of orthodontic appliances. So long as we are compelled to do corrective work and the dentist is compelled to do replacement work, the mechanical side is not only important but is absolutely indispensable. Until we reach that point and we have not as yet, where the prevention of malocclusions and malformations predominates, then and only then, can we relinquish our intensive study and research work of orthodontic mechanics and appliances. Without decrying the necessity or minimizing the value of a thorough, careful and intelligent diagnosis of malocclusions, I am constrained to believe that more failures are the result of the unscientific and mediocre construction and the careless and unintelligent use of appliances than any other cause. I am not so much concerned at present regarding the relative status of the practice of Orthodontia and the practice of Medicine. Medicine has had several centuries in which to develop, while Orthodontia has had but a few years, and still Medicine today is in some respects practiced empirically, which cannot be said of the practice of modern Orthodontia. Please do not misunderstand me, I am thoroughly conscious of the stupendous, marvelous and almost incredible work and the tremendous advancement made in Medical Science, and it seems obvious at present that if the Science of Orthodontia is to advance in the study of prevention, in diagnosis, in the correlation, in development of all parts of the body, it must depend largely upon Medical Research and Medical Practice, and we will of necessity, and should of our own volition ally ourselves with the Medical Profession. It is my opinion that permanent and lasting results can only be obtained in this manner. I am inclined to believe that Dr. Howard has a misconception of the relative importance placed upon the classification of occlusion by the present orthodontists in the diagnosis of an orthodontic deformity, the cause and effect of such deformity and the treatment, care, correction and retention of it. If there is any one thing we are positively certain about, regardless of the individual characteristics or the individual normal, it is the correct mesiodistal occlusal relationship. Therefore, a knowledge of the occlusal classification is paramount. A study of the occlusal relations, however, does not complete the diagnosis, neither does it indicate the full care and treatment of the case. Notwithstanding this, I believe the Angle classification of occlusion was one of the greatest contributions ever made to orthodontia, and marks a distinct and important epoch in its history. Since my initiation into the practice of orthodontia some twenty odd years ago, there have been many, varied, and important advances. The field of study has been tremendously enlarged and has been made to incorporate and cover most all phases of subjects which concern the physical and mental development of the child. We have not had the cooperation of the medical men that we should have had. It has been and is now a difficult thing to interest the average rhinologist. He is much less concerned about malocclusions of the teeth and malformations of the jaws than we are about his field of practice, and yet we know and recognize the fact that the work of both is so intimately associated that failures may and often do result without cooperation.

As stated before, I am in accord generally with the thoughts expressed by Dr. Howard relative to a broader scope of study in the field of orthodontics, in the study of prevention and the correlation of all parts of the body in the development and growth of the child. The accomplishment of these things can only be realized through a close cooperation with medical science, intrusive research work, and a coordination of the whole study and investigation.

I hope that the members will take action upon the president's recommendation relative to revamping the Constitution and By-Laws, so that each article will be con-

sistent with the other and that they may meet the ever-increasing requirements of the society.

I am not in favor of any plan for the reorganization of the American Society of Orthodontists that will extend its field and membership by the organization of component societies. I am afraid the original purposes and objects would be defeated and the real constructive work of the society limited.

In closing I wish to commend Dr. Howard for his masterful address, for the constructive thoughts and suggestions contained therein, and thank him for the many personal courtesies bestowed.

A DEFINITE METHOD FOR STIMULATING NORMAL GROWTH OF THE MANDIBLE*

By George W. Grieve, D.D.S., Toronto, Canada

MORE than a quarter of a century ago a pioneer in the practice of orthodontia as a specialty, Dr. Edward H. Angle, recognized "occlusion," which he defined as "The normal relations of the occlusal inclined planes of the teeth when the jaws are closed." This discovery placed orthodontia upon a scientific basis. He later established a definite classification, placing all cases of malocclusion into three groups, "based on the mesiodistal relations of the teeth, dental arches and jaws."

It is intended in this paper to discuss the treatment of a certain type of case which falls within the second group—Class II—"Lower arch distal to normal in its relation to the upper arch" (Angle). In the terminology suggested by Dr. Lischer, and adopted by the American Society of Orthodontists, this type of malocclusion is described by the term "distoclusion." Lischer, in a paper read before this society, at Atlantic City, in 1921, gives the following definition: "Distoclusion is a dento-facial deformity characterized by a distal, or posterior, relation of the mandibular dental arch to the maxillary dental arch, but without extreme mal-formations of the jaws." He speaks of a distal position of the teeth in the mandible as constituting a "true distoclusion," and suggests that in the course of time, as our diagnostic methods become more accurate, some of those cases where the mandible is distal in its relation to the maxillae will undoubtedly be recognized as "micromandibular and mandibular retroversion deformities," and states that the distoclusion in these cases is "merely a symptom."

Angle (Malocclusion of the Teeth, 7th edition, page 46), in discussing cases of Class II, Division 1, says: "Not only are all of the lower teeth effectually locked in distal occlusion in these cases, but the mandible is also distal in its relation to the maxilla and usually smaller than normal." In the writer's experience, the majority of cases now classified as distoclusion cases conform to the type defined in the preceding quotation from Angle. According to Lischer, these are not true distoclusions. There is considerable variation also in the positions which the teeth occupy in both maxilla and mandible in many cases, and also in the relation which the mandible bears to the rest of the face, requiring different detail of treatment. It would seem that a more definite classification should be made of the cases placed by Angle in Class II (distoclusion), in order to cover these variations.

About fifteen years ago a very well-known practitioner made the statement somewhat to the effect that any average orthodontist could correct cases of Class II (distoclusion), but he would "take off his hat" to the man who could retain them. Our difficulty in retention has undoubtedly been due to

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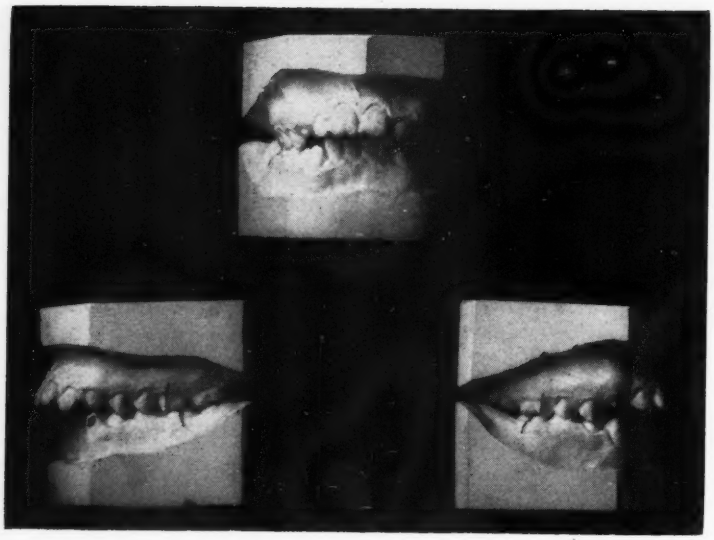

Fig. 1.

Fig. 2.

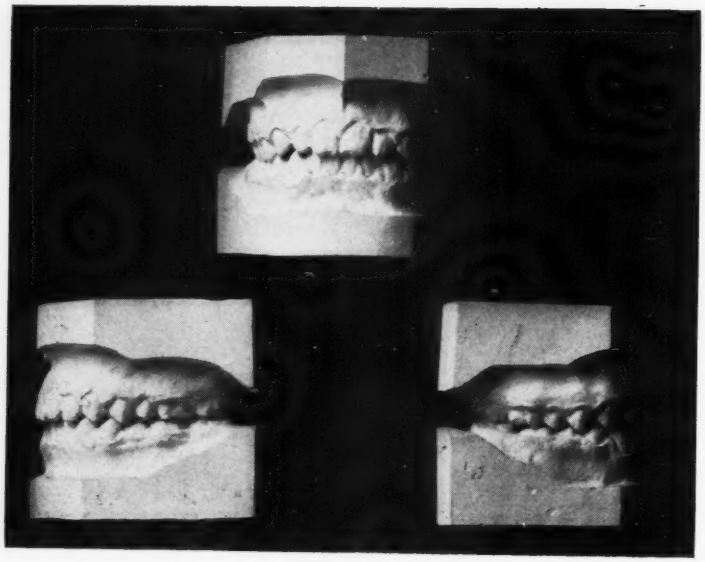

Fig. 3.

faulty methods of treatment. Notwithstanding the inefficiency of the then known methods in practice, very beautiful results were being obtained by many operators in the treatment of a small percentage of cases of Class II, where there was nearly normal growth of the mandible, and a certain degree of success, also, in those cases lacking this growth in so far as the correction and postmaintenance of the normal mesiodistal relations of the teeth was concerned, but little progress had been made in stimulating growth of the mandible in those cases of the latter type.

Fig. 1 shows original casts of a girl thirteen years of age, whose case was corrected with ordinary expansion arches in the years 1910 to 1911; and

Fig. 4.

Fig. 5.

Fig. 2 shows the full face and profile views of the patient. It will be noticed that there was a slight protrusion of the upper lip, and just a little lack of forward growth of the mandible. Retainers were removed from the mandibular teeth in December, 1911, and from the maxillary teeth in March, 1912. Fig. 3 shows casts made in March, 1914, two years later, and Fig. 4 shows different views of the young lady at that time. The patient was seen in 1919, the teeth had held perfectly, and the appearance of the lips was slightly improved, as shown in Fig. 5. In the treatment of this case the maxillary incisors were tipped lingually too far, and the facial lines were thus not improved as much as would have resulted if these teeth had not been carried back quite so far, and normal growth of the mandible could have been obtained.

Fig. 6 shows full face and profile of a similar case—a little girl nine years of age, a confirmed mouth breather. This patient was treated in the same manner, but the teeth had to be retained for many years before normal lip function could be established. In this case, again, there was nearly normal growth of the mandible. Fig. 7 shows the original casts and Fig. 8 those made at the time of removal of appliances. Fig. 9 shows the young lady herself one year later, at which time the teeth were in wonderful occlusion and the lips functioning normally.

Fig. 6.

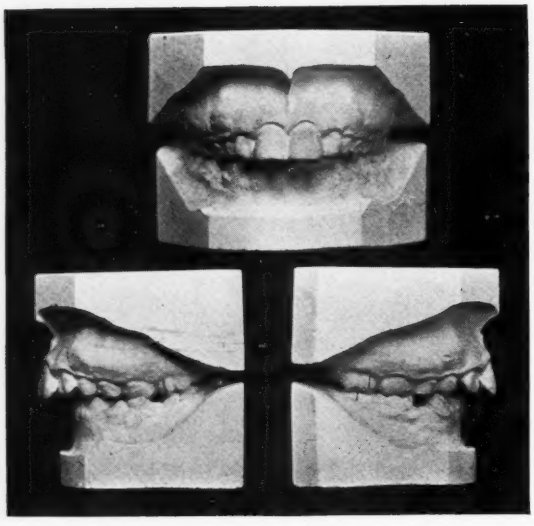

Fig. 7.

It was no trick to correct these cases, even with simple appliances, and maintain the normal relations, because there was a base upon which to build—a fairly good mandible.

Fig. 10 shows the original casts and Fig. 11 the photographs of another case, that of a girl of fifteen years of age, with which the writer *struggled* for many years with simple appliances (those which tip the teeth) and intermaxillary elastics, and later with the pin appliance, without planes, before it was possible to maintain the normal mesiodistal relations of the teeth. Fig. 12 shows the young lady after the siege, and Fig. 13 shows the casts one year after the removal of all appliances. In this case there was not a suitable base

upon which to build, and the writer did not, at that time, know how to obtain a reliable substructure—a normal mandible. This is now an easy problem with the technic which will be described today. In this case the maxillary right first molar had to be sacrificed, as its crown was nearly all gone, and there was a bad abscess upon one of the buccal roots. Both mandibular first molars were also in bad condition, and were the writer commencing the correction of such a case today these two teeth would also be removed. The

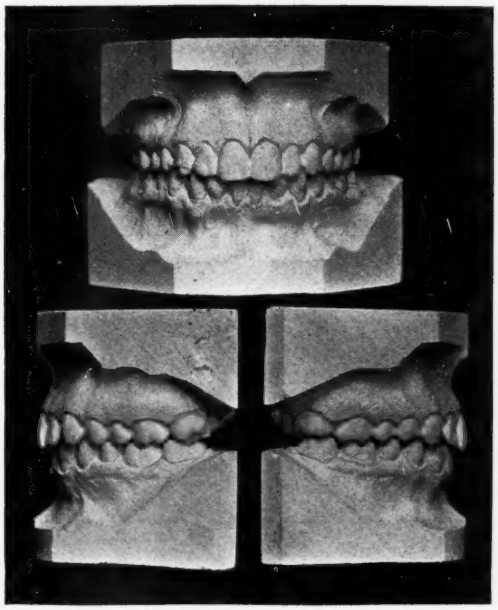

Fig. 8.

Fig. 9.

third molars being present, all spaces would be closed by the use of delicate U-springs.

One of the earliest methods used in the correction of cases in this group was that introduced by the late Dr. Norman W. Kingsley, which he termed "jumping the bite." This was not entirely successful, as used at that time, and was pretty generally abandoned, but had great merit, and forms the basis of the method which the writer will present for your consideration at this time.

Later, there was introduced by Dr. H. A. Baker, of Boston, what is now known as the "Baker Anchorage." According to Dr. Angle, this is a modification of the latter's "Intermaxillary Anchorage," introduced in 1890.

A few years ago, Dr. Alfred Paul Rogers, also of Boston, introduced a series of exercises for the development of the associated muscles. By means of the pterygoid and masticatory exercises, it is possible, if cooperation of the patient can be obtained, to stimulate Nature to produce more or less growth of the mandible. The use of these exercises, in conjunction with intermaxillary elastics, is in pretty general use today in the treatment of the type of case under discussion.

Fig. 10.

Fig. 11.

The "Baker Anchorage," in the opinion of the writer, is not properly applicable in the treatment of a very large percentage of cases of distoclusion. The use of intermaxillary elastics is indicated only where it is desired to move teeth in the bone, which type of case will not be discussed in this paper. In the majority of cases of distoclusion the mandible is more or less under normal size, and is out of harmony with the rest of the face; in some there may be a certain amount of protrusion of the maxillary teeth, as shown in Fig. 14, but the main feature is the lack of forward growth of the mandible, which condition may be found, also, to a certain degree, in some cases in neutroclusion.

In many of the distoclusion cases the incisal ends of the mandibular

incisors are found to be tipped very decidedly to the labial, accompanied very often by a mesial tipping of many of the mandibular buccal teeth. If the mandible in such a case is lacking in its forward growth, the logical procedure would be to tip the incisors lingually and the other teeth distally until all stand at the normal angle of inclination, and then, associated with an efficient appliance, place either incisor or buccal planes, as indicated by the amount of overbite, or rather by the vertical growth in the posterior region, and thus establish conditions favorable for Nature to build a normal mandible, detail of which appliances will later be described. Cases of this type

Fig. 12.

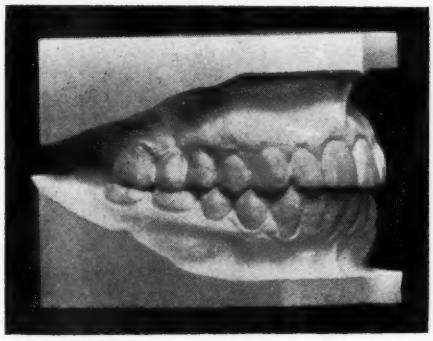

Fig. 13.

which have been treated by carrying the mandibular incisors labially and the buccal teeth mesially, the writer would venture to say, have invariably failed. When the appliances are removed, after treatment by the latter method, the mandibular incisors very soon tip lingually and crowd more or less; this is later followed by crowding of the maxillary incisors and the re-establishment of an excessive overbite, if such originally existed. When mandibular incisors tip lingually, after the removal of appliances, they do so as a result of their having been carried labially beyond the main body of the bone—a position which Nature never intended them to occupy. The reason that these incisors originally lean labially may be because the lack of forward growth of the mandible has curtailed the normal space for the tongue, and

the latter organ, by its pressure against these teeth, tips them forward. When the growth of the mandible and dental arches is normal, the requisite room for a normal tongue is provided.

It is impossible to successfully treat cases of this type by the use of intermaxillary elastics and appliances which tip the teeth, because by this method the already leaning mandibular incisors are still further tipped. *These cases, when treated in this way, cannot be maintained.* If, on the other hand, a bodily-moving appliance is used, in conjunction with elastics, the roots of the mandibular incisors may be carried forward beyond the body of the bone, and where this is done there is danger of breaking down the labial plate of bone overlying these teeth and a certain amount of recession of the soft tissues is the result.

Failure in his endeavors, covering a period of years, to successfully correct many of these cases by the use of intermaxillary elastics and simple

Fig. 14.

appliances, impelled the writer many years ago to utilize in their treatment the most efficient appliance yet devised—the pin appliance (Fig. 15). Even with this appliance it was impossible to satisfactorily complete those cases where there was a definite lack of growth of the mandible, and about three years ago experiments were started with the view of combining with the pin appliance a modification of the late Dr. Kingsley's method of "jumping the bite." It is thus possible to prevent tipping of the teeth, and, with the maximum anchorage obtained, there is little, if any, mesiodistal movement of the teeth in the bone. Experience in the use of this method has demonstrated beyond a doubt that there is produced actual increase in the length of the mandible from the condyles to the symphysis. It seems reasonable to expect, after this growth has actually taken place, that there will be no relapse.

Two former papers on the pin appliance have been presented by the writer. The first one covered the technic of construction and adjustment of the bands and arch wire, and was published in the *International Journal of Orthodontia* for December, 1920. In the second paper was discussed the

use of the appliance in conjunction with auxiliary springs and individual bite planes upon the incisor teeth. This was published in the *Dental Cosmos* for June, 1922. Many points of technic covered in the former papers, in order to save time, will not again be described here.

When Dr. Angle introduced his pin and tube appliance, in 1910, the arch, which was in three sections, was 0.030″ in diameter. With the introduction of the Angle-Young lock, the arch was constructed in one piece, the principle

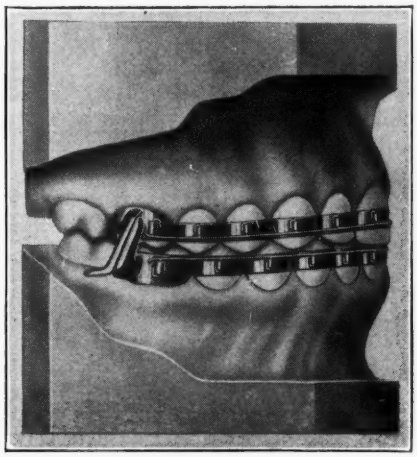

Fig. 15.

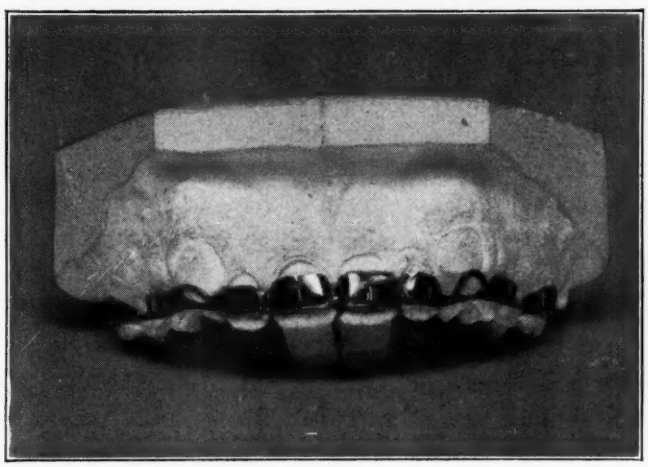

Fig. 16.

of the screw was abandoned and loops were used to shorten or lengthen the arch wire. The writer, after using this appliance for some years, felt that a lighter arch would be more pliable, and commenced using 0.028″ wire in its construction. A large number of arches for the mandibular teeth, where the attachments were so close together, were made of 0.025″ wire. Later many of the loops were eliminated and the use of auxiliary springs adopted, all of which has been described in a former paper. It was later found that the use of lighter arch wire was a mistake, except where used upon the deciduous denture, and a return was made to the 0.030″ wire in the average

case in the permanent denture, with 0.032″ wire where a great deal of bodily expansion was necessary, and 0.028″ wire in only a few cases, particularly upon the mandibular teeth, where only slight development was required. The use of the 0.025″ arch wire has been abandoned by the writer entirely.

The light auxiliary springs are now being used very extensively with extremely gratifying results. Individual teeth which stand very definitely out of harmony with the line of occlusion can be handled with the U-spring, with or without half-round pin attached, depending upon the requirements, with much greater facility than by having these teeth attached to the main arch. The larger arch wire gives a more stable base from which to deliver force by means of the springs. In using the U-springs, if it is desired to move the root of a tooth, a half-round pin is attached to the spring, but if the tooth requires tipping, the end of the spring is bent to enter the tube; in this instance the wire has lots of play in the tube and the tooth may be tipped as desired.

About fourteen years' experience with the pin appliance has demonstrated to the writer the definite way in which it is possible, by its use, to place teeth in the line of occlusion, with their roots standing at the normal angle of inclination. When one has developed a good technic in its use, it is a pleasure to work with it, because it fulfills every requirement. There is no tooth movement desired which cannot, with absolute precision and delicacy of force, be effected by the use of this appliance and its auxiliaries. The criticism that it "holds the teeth too rigidly" has probably been offered by those who were unfamiliar with a proper technic in its use. It is not necessary, with this appliance, to "harness up teeth" so that they have no freedom of movement; the exercise of care in its adjustment will avoid this. There are no "Blue Mondays" for orthodontists who have developed skill in the use of the pin appliance; its efficiency, when intelligently applied, creates optimism where discouragement formerly existed.

In the treatment of a case where there is great lack of development of the dental arches, and where the teeth are crowded, bands should not at first be placed upon all teeth requiring movement, but only upon selected ones which will best facilitate the necessary stimulation. Further bands are added as the space is provided. Teeth which are held tightly together cannot move, so care must be exercised to avoid this. The operator cannot "see" whether teeth are binding or not, but he, as well as the patient, can "feel" it. A thin piece of banding, to which has been soldered some form of handle, such as a loop of wire, should always be at hand to "feel" for space between the teeth. (The idea of the handle was suggested to the writer by a former associate, Dr. Harvey Bean.) One might call this important little instrument a "space feeler." By its use the operator can ascertain whether teeth are too tight together to permit their movement, or whether there is excess space.

In constructing the arch, an endeavor must be made, as explained in detail in a former paper, to use as nearly as possible the proper amount of material, so that there shall be sufficient, but no excess. The wire may be bent into the interspaces between teeth where they are crowded, or very slight semblance to loops may be used if necessary. Of course, where there

is not sufficient space for a tooth which has not erupted, or is entirely out of the line of occlusion, a loop of the desired amount of wire should be made. Slight increase in length of the arch wire, where required, may be obtained by pinching with Angle's wire-stretching pliers. The tendency in using this instrument is to stretch the wire too much, so care must be exercised to avoid this.

Bands for the mandibular incisors should be so located upon these teeth as to permit of the tubes being placed sufficiently low to allow for a normal overbite without the maxillary incisors overlapping the arch wire. Where tubes 0.08″ long are used, the distance from the gingival end of the tube to the incisal end of the tooth should be at least 0.20″. If maxillary incisors and canines occupy a position below their normal relation to the line of occlusion, or mandibular incisors and canines above their normal relation to this line, or if the maxillary teeth lean lingually at their incisal ends (as in the second division of Class II, Angle), or the mandibular teeth labially, it will not be possible to obtain the normal forward growth of the mandible until such abnormal positions and angle of inclination of these teeth have been corrected. This applies equally to cases in neutroclusion and distoclusion. Neglect on the part of orthodontists to recognize and correct these conditions is responsible for many failures.

In many cases in the group under discussion there is a lack of normal vertical growth in the posterior region, both in the maxillae and mandible, as well as horizontal growth of the latter. In these cases it is possible to expedite treatment by the proper use of inclined planes.

INCISOR PLANES

Where there is an excessive overbite, and lack of normal vertical growth in the posterior region, the use of individual incisor planes, of proper design, will produce conditions favorable for the vertical growth desired in both maxillae and mandible, as well as horizontal growth in the latter where required. Figs. 16, 17 and 18 show different views of these planes. They should be made sufficiently long to prevent the patient biting the mandibular teeth back of them. Detail technic for their construction will be given later. In the use of these planes in the treatment of distoclusion cases it cannot yet be proved as to just what takes place, but the mandible seems to become longer from the condyles to the symphysis. From time to time, as treatment progresses, and growth of the mandible is obtained, the planes may be shortened until they finally are down to less than one-quarter of an inch in length, and the patient unable to bite back of them. In one case under treatment by the writer—a boy ten years old, associated with lack of growth of the mandible—was a slight protrusion of the maxillary incisors. Fig. 19 shows the casts and Fig. 20 the profile of this patient. When planes were placed upon the maxillary central incisors, which teeth had previously been tipped lingually a little, it was necessary to make them three-quarters of an inch long in order to prevent the patient biting the mandibular incisors behind them. Pins were not placed upon the arch for the maxillary central incisors at this time, as it was intended to intrude these teeth slightly and

permit them to tip still farther lingually. This movement took place very quickly, and, when completed, the pins and locks for these teeth were soldered to the arch. The rapid growth which took place in the mandible, coupled with the tipping of the maxillary incisors, permitted shortening of the planes half an inch in about one month's time.

Incisor planes were discussed by the writer in a paper presented before the Eastern Association of Graduates of the Angle School of Orthodontia, at Washington in November, 1921, and it was felt then that by making these planes steep, and using an appliance which prevented tipping of the teeth, in the treatment of cases of distoclusion there was produced a stimulation to growth

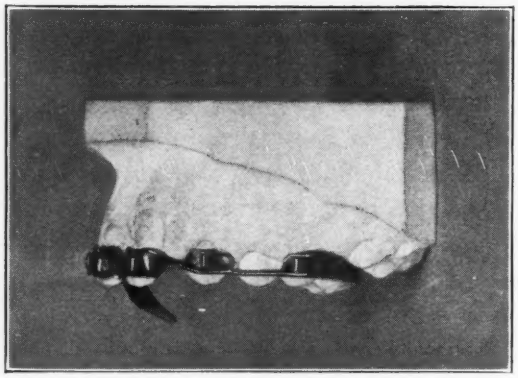

Fig. 17.

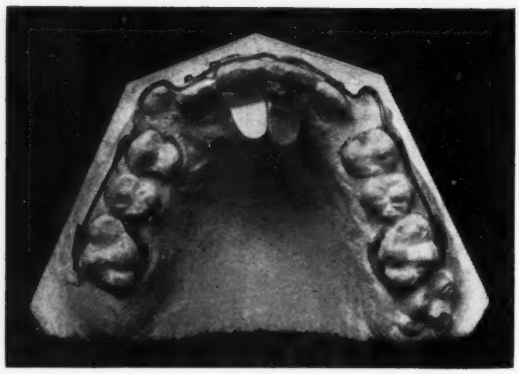

Fig. 18.

of the mandible. Prior to that time bite planes of various types had been used, with a few exceptions, more particularly for the correction of excessive overbite. After considerable experimenting, covering a period of a year or more, it was finally decided that the steepest planes that could possibly be used were the most efficient in producing conditions favorable to normal growth of the mandible. Reference to the earlier use of incisor planes was made in the paper referred to above.

To establish a definite technic for constructing these planes at the desired angle, a little instrument was devised which might be called an "incisor plane angle guide" (Fig. 21). The vertical portion is a piece of the small half-round pin wire about two inches long. Soldered at right angles to the flat

side of this, at about its center, is a piece of sheet metal about 0.15″ wide, but narrowed down at the point of its attachment to the half-round wire. About 0.35″ from the half-round wire this extension of sheet metal is turned upward at an angle of 28 degrees from the long axis of the half-round wire; the latter portion, which should be approximately 0.42″ long, is the part which is the "guide" as to the angle of the plane. The extension is stiffened upon its inner surface with solder.

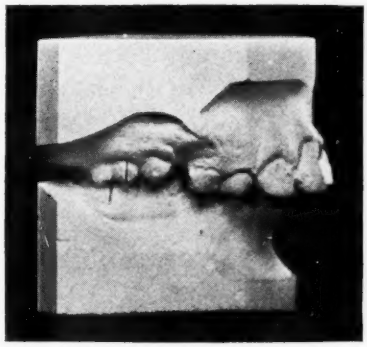

Fig. 19.

Fig. 20.

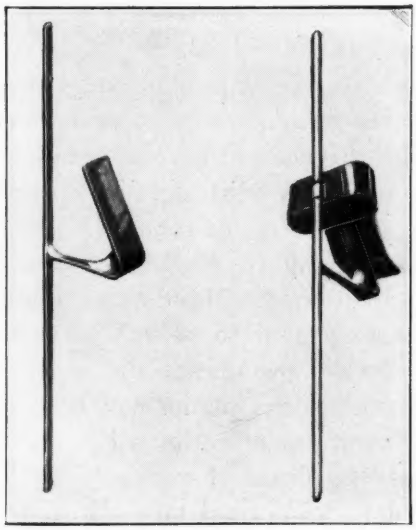

Fig. 21.

In constructing an incisor plane, a piece of molar band material 0.23″ wide is soldered, freehand, at approximately the desired angle, to the palatine surface of a maxillary central incisor band at a point which will permit just a little less than the normal overbite. The half-round wire of the angle guide is now slipped into the tube upon the labial surface of the band to a point where the guide comes in contact with the plane, as shown in Fig. 21. It can now be seen if the plane has been set at the proper angle, and if not it is so adjusted. If an incisor is particularly thick, labiolingually, the guide will not actually come in contact with the plane, but the latter can be set parallel to it. One width of the banding material will usually not give sufficient length of plane to prevent the patient biting the mandibular inci-

sors behind it, so a second piece of banding is soldered to the first, lapping the edges slightly. This plane will now be so long that, with the teeth in occlusion, it will strike either the lingual surface of the mandibular incisors or the soft tissues lingual to them. About one-fifth of an inch from the attachment of the plane to the palatine surface of the maxillary incisor band the plane should be turned back slightly to prevent the interference before mentioned. The band is now placed upon the tooth and the patient instructed to endeavor to bite the mandibular teeth behind it; if this is possible, a further piece of banding is soldered as before and probably turned at a still lesser angle, but not to the extent of being horizontal. The length of the planes shall be just sufficient to prevent the mandibular incisors being placed behind them, the portion next to the band being about the width of the tooth which is going to carry it, but may be narrowed gradually from the first bend backward. It is important that the "steep portion" next to the band shall be at an angle of 28 degrees from the long axis of the tooth, and shall not be longer than one-fifth of an inch. Each plane must be tested with the guide, after fitting, before being invested for reinforcement with solder. All edges exposed to the tongue must be rounded and smooth.

It has long been the custom with many orthodontists, in the treatment of these cases, to first equalize the dental arches, and then institute proceedings to correct the mesiodistal relations and the excessive overbite, if such exists. The time consumed in treatment will be very much reduced by having the whole process of growth going on simultaneously, which is possible, in many cases, by the method here advocated.

If maxillary central incisors, upon which it is desired to place inclined planes, are rotated, or require tipping lingually, these movements should first be obtained before placing the planes, except under special conditions as before mentioned. Mandibular incisors must also be sufficiently regular in their arrangement to permit of their biting up into the space provided for them between the planes and the palatine surface of the maxillary incisors. In many cases the planes can be placed at the commencement of treatment; this will put out of action all interference and permit the whole treatment of the case to proceed at once. With the planes in position, the mandible comes forward to its normal mesiodistal relation with the maxillae every time the jaws are closed. This produces the same effect in the way of stimulation to growth of the mandible as Rogers' pterygoid exercise, with the advantage that the former method is more definite because it is not under the control of the patient.

The vertical growth in the posterior region is facilitated by the proper adjustment of the arches. Care must be exercised in distributing the load, that is, the arches must be set, and the locks located, so that as many teeth as possible will be utilized to carry the force of impaction when the mandibular incisors come in contact with the planes. The vertical growth in the posterior region takes place rapidly, and the buccal teeth are very soon again in occlusion. If intrusion of incisors carrying planes, or those in the mandible, is desired, locks must not be placed upon the arch for these teeth until they have reached the desired plane. Detail of locks was covered in a former paper.

The use, in conjunction with incisor planes, of Dr. Young's method of building up the deciduous molars, where present, with overlays would make an ideal combination where it is felt that the strain was going to be too great upon the incisors, or where it is particularly desired that the incisors be not intruded.

BUCCAL INCLINED PLANES

The planes for the posterior region are usually soldered to the first permanent molar bands, or upon the second molars in the deciduous denture. (See Fig. 15.) They are a modification of the plane and spur introduced by

Fig. 22.

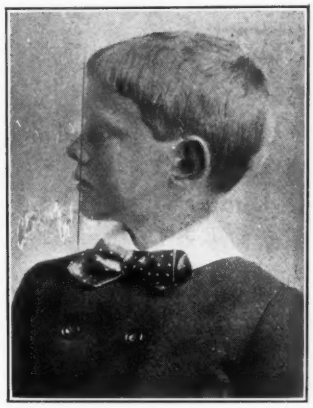

Fig. 23.

Fig. 24.

Dr. Angle. Both plane and spur and the double planes were used many years ago in the retention of cases of distoclusion. The writer does not know to whom credit is due for the first use of the double planes, unless it be to Dr. R. P. McBride, of Dresden, Germany. Dr. McBride used somewhat similar planes previous to 1906 upon a removable appliance. Dr. Angle used the plane and spur, also, for the retention of cases treated by the late Dr. Kingsley's method. Fig. 22 shows the original profile of a boy whom Dr. Angle treated by this method, and Fig. 23 the same boy after treatment, of which he says: "The author was greatly gratified with his success in this case, and believed it to be a most desirable plan of treatment." ("Malocclusion of the Teeth"—Angle, pages 502-3.) The writer is convinced that it

would have proved so had sufficient anchorage been utilized to prevent tipping of the teeth. As used at that time, the normal mesiodistal relations of the teeth were held, but the latter tipped and the mandible "slowly drifted back to probably very nearly its former relation with the skull" (Angle, page 502). Fig. 24 shows another profile picture of Dr. Angle's patient three years after the discontinuance of retention (Angle, page 504).

In the construction of the buccal planes any detail of technic which appeals to the individual operator may be used, but, in their use with the pin appliance, it is important that the half-round tubes be placed as far mesially upon the buccal surface of the maxillary molar bands as possible without getting them on the curved portion of the bands in the interspace. (See Fig. 15.) The reason for this will be evident when placing the planes upon the mandibular molar bands. For the base of the planes the writer uses clasp metal about 0.15″ wide and 0.015″ thick, and does the fitting in the mouth. The edge of the base for the maxillary plane is soldered, freehand, at a right angle to the buccal surface of the band, and far enough distal of the tube to permit the mandibular plane, when the teeth are in occlusion, to pass up between the tube and plane on the maxillary band—about 0.08″. The steep portion of the maxillary plane should lean distally at an angle of about 28 degrees, and extend nearly to the soft tissues overlying the mandibular teeth when the latter are in occlusion with the maxillary teeth. The plane at this point should now be bent distally at a lesser angle, as shown in Fig. 15, just sufficient to clear the soft tissues and extend far enough back to prevent the patient placing the mandibular plane distal to it. The maxillary plane may be in one piece, or, after fitting the steep portion with the mandibular plane, an extension may be added as advocated for the incisor planes.

The planes for the mandibular molars must extend far enough buccally to clear the buccal surface of the maxillary teeth and, if necessarily long, the overlying soft tissues and permit a little lateral swing of the mandible. In constructing the mandibular plane, solder a short piece of the clasp metal at right angles to the plane proper, in the form of an L, lapping the material its full width; now trim and fit the horizontal portion to obtain the requisite buccal extension, and solder to the band at the desired angle. The mandibular plane, when the teeth are in occlusion, may, or may not, extend above the gingival border of the maxillary molar, depending upon the distance which the patient can separate the jaws. Care must be taken to have the planes at right angles to the buccal surface of the teeth, and so placed as to establish the normal mesiodistal relations of the molars upon which they are placed, each side independent of the other. *The planes should not lean out toward the cheek, but be parallel with the latter.*

The maxillary planes are now invested and reinforced with solder. When this has been accomplished they are fitted again and any necessary adjustment made of the mandibular planes, when these also are ready for reinforcement. The finished planes need not be wider than 0.10″, their buccal edges smooth and in line when the teeth are in occlusion, provided that the maxillary and mandibular molars occupy relatively normal buccolingual relations. If rotation is required of any molars upon which planes are to be

placed, this rotation should be obtained before placing the planes, unless such rotation would be facilitated by the action of the planes, in which latter case the planes must be so located that when the rotation has been accomplished, the molars will occupy their normal mesiodistal relations and the planes be in proper relation when the teeth are in occlusion. As the mandible grows, the planes may be shortened, just as in the case of those upon the incisors.

The buccal planes are in use at the present time in the writer's practice upon a large number of cases, of widely varying ages, but only in one has the

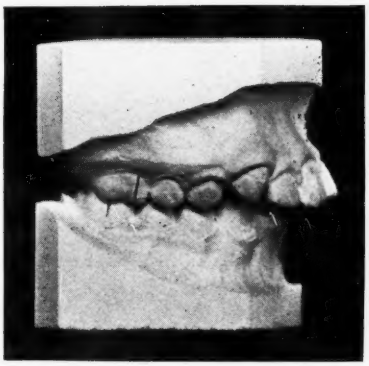

Fig. 25.

Fig. 26.

Fig. 27.

appliance been removed. This was the case of a boy twelve years of age when treatment was commenced, in whom there was a lack of forward growth of both maxillae and mandible, as well as the nose. Fig. 25 shows the original casts, and Fig. 26, the profile of the patient. This case had been under treatment, by the method commonly in use, for three and one-half years; the equalizing of the dental arches had been accomplished and the excessive overbite corrected by the use of incisor planes of the old type, not being steep. Every effort was made during treatment to have this boy do Rogers' pterygoid exercise, with but little if any result in obtaining the desired

growth of the mandible. Buccal planes were placed in April, 1922. This was the first case where these planes were used by the writer in conjunction with the pin appliance. The planes were not made sufficiently steep at first, as a result of which considerable time was lost, but they were later steepened. In April, 1924, after the planes had been in use two years, a break occurred in the appliance, and at that time the full growth of the mandible had not been obtained, but the writer was so optimistic as to the result that it was decided to remove all appliances and see what would take place. This patient was seen just a few days ago (April, 1925), and while he can bite the mandible back a very little distal to its normal position, he says it is uncomfortable there, and it is quite evident that the teeth, when in occlusion, rest habitually in their normal mesiodistal relations. The facial lines are not all that could be desired in this case because, during the commencement of treatment, the maxillary teeth had been carried distally somewhat, which should not have been done. Ideal results could be obtained in such a case as this by a proper application, from the beginning of treatment, of the method here advocated. Fig. 27 shows profile of this patient now. Final casts have not yet been made.

The writer is convinced that the more fully the forward growth of the mandible is obtained, before the removal of appliances, the greater will be the success in the use of this method.

Fig. 28 shows the original casts and Fig. 29 the profile photograph of another boy, aged ten years when appliances were first adjusted. This case was under treatment and retention for five years, by the usual methods, without obtaining results which the writer felt would be permanent. For several years every effort was put forth, also, to have this boy do Rogers' pterygoid exercise, but with very little apparent improvement in the forward growth of the mandible. The pin appliance, with incisor planes, was placed in March, 1921. The planes were not sufficiently steep at first, and were later changed. All appliances were removed in April, 1924. Fig. 30 shows casts made in March, 1925, and Fig. 31 the profile of the patient. This patient's maxillary lateral incisors were under normal width, and full mesiodistal space was not maintained in this region, as a result of which, coupled with the fact that the mandibular incisors were carried labially a little too far, and naturally dropped back, there is now a slight crowding of these teeth. The writer usually trims mandibular incisors to compensate for lack of normal width of maxillary lateral incisors, if the latter are not too much under normal width. In several cases now under treatment provision is being made for placing jacket crowns upon maxillary lateral incisors which are markedly under normal width.

These two cases were completed, the former with buccal planes and the latter with incisor planes, where the use of intermaxillary elastics, Rogers' exercises, and even the pin appliance (without planes) had failed. In neither case were the planes sufficiently steep when first placed, because the most efficient grade (steep) had not been established at that time, nor were the appliances worn sufficiently long to obtain full growth of the mandible. In the case where incisor planes were used, buccal planes should also have been

used in order to establish absolutely normal mesiodistal relations, because the excessive overbite was corrected before the full growth of the mandible had been obtained. These cases did not respond quickly to treatment, because of the fact that considerable time was lost as a result of not having the planes sufficiently steep when first applied.

The writer believes that quite difficult cases can be corrected by this method in about two years, or less, of actual treatment, with possibly six months to one year at most of retention with buccal planes. *It is very important that the planes be steep, and that the full forward growth of the mandible be obtained before the removal of the appliances,* in order to establish absolutely normal mesiodistal locking of the cusps of the mandibular and maxillary teeth.

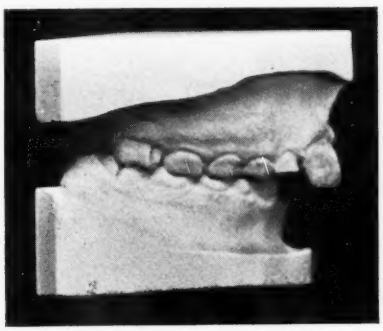

Fig. 28.

Fig. 29.

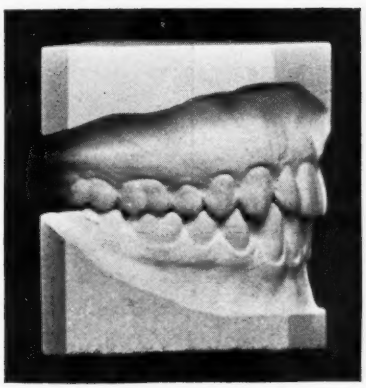

Fig. 30.

After considerable observation and experience in the treatment of distoclusion cases, the writer is now convinced that the common mistake in many of these cases has been an attempt to carry the mandibular incisors labially, when they should have been tipped lingually, and by the use of inclined planes and the maxium anchorage, conditions made favorable for normal growth of the mandible.

The method advocated in this paper for the treatment of cases of this

type is one which has been developed as a result of several years' earnest and painstaking endeavor to overcome the difficulties encountered in the correction and postmaintenance of this heretofore difficult type of malocclusion. In a scientific problem of this nature it requires a number of years to establish, beyond the possibility of doubt, that any method is going to be absolutely successful, but, so far as the actual treatment of these cases is concerned, it is now felt by the writer that this is the most definite method yet devised. No originality is claimed except for a more scientific application of an old principle.

The establishment of a standard grade, or angle, for both types of planes, and the necessity for utilization of the maximum anchorage to prevent tipping of the teeth are the chief factors in the newer application of the principle. By this method the mandible is lengthened, rather than that the teeth are moved forward in the bone, which latter, in some cases, is impractical, if not impossible.

Fig. 31.

The buccal planes, with which the writer has had only three years' experience in conjunction with the pin appliance, were resorted to when it was discovered that after the normal overbite had been established by the use of incisor planes the latter were no longer efficient in stimulating the forward growth of the mandible. Buccal planes exercise a much more definite action in this regard than do incisor planes, and of course are applicable in cases with normal overbite. The best results will probably be obtained by the use of both types simultaneously in the treatment of cases requiring vertical growth in the posterior region. It would seem to be good practice to utilize buccal planes for about six months in the final stage of retention of these cases, with the addition of bands upon the first premolars with extensions to molars, a lingual arch upon the mandibular teeth and a Hawley removable retainer upon the maxillary teeth.

The method of treatment outlined here is being practiced by the writer, and also by his associate, Dr. G. Vernon Fisk, in a large number of cases.

and while there now seems to be no doubt but that the mandible grows longer, definite claims cannot be made for the permanency of these cases until a large number of them have been completed and without appliances for at least a couple of years.

The degree of our success in the practice of orthodontia is governed by our ability to interpret what Dr. Angle called "Nature's Architectural Plan," and the skillful adjustment of efficient appliances to remove all interference and establish conditions favorable for normal growth and development of maxillae and mandible.

NOTE.—Since the presentation of this paper at Atlanta, a new type of lock has been suggested by Mr. O. G. Halldorson, an assistant in the office of the writer. It is a modification of one designed by Dr. J. Lowe Young, and is made of fine soft wire. The Young lock is soldered to the arch wire, while the Halldorson lock is soldered end to end upon the half-round pin after the latter has been soldered to the arch and trimmed to proper length. A small notch should be filed in the end of the pin, into which notch the lock-wire is soldered; this permits bending the lock wire down close to the pin

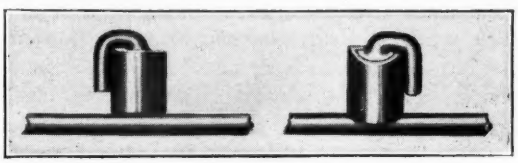

Fig. 32.

and the tube. Fig. 32 shows detail of this lock. The soft wire is straightened out to permit withdrawal of the pins from the tubes. It is not necessary to place locks upon all teeth as shown in Fig. 15.

DISCUSSION

Dr. Herbert A. Pullen.—The type of case which the essayist has chosen to discuss in his paper, the 1st division, Class II, Angle's classification, or distoclusion, might in a certain sense, because of the time I have spent in the study of its diagnosis and of its vagaries of treatment, and because of the papers I have written on it, be called a hobby of mine. However, the longer I ride this hobbyhorse, the more certain I am that it takes an expert horseman to sit this hobbyhorse well and not be in danger of "riding to a fall," as the saying goes.

After spending a day in the office of Dr. Grieve, watching him operate, and seeing the results of his perfected technic in the successful treatment of dozens of cases of this class, I feel like dismounting from my hobbyhorse, and handing my refractory steed over to Dr. Grieve, who, I am sure, can ride him bareback.

It is refreshing in these days when everything tends towards standardization to find an individual who has cast off the fetters of standardization and broken a trail for himself, which has been carefully blazed, however, for others to follow,—if they can. The trail leads to the "hut in the woods" where Emerson has proclaimed that every genius may reside and a trail will be blazed to his door where he will receive homage. In this particular case the genius resides at 2 Bloor St., Toronto, where he is always at home to his friends.

There is a biblical saying to the effect that "the stone which the builders refused has become the head stone in the corner," and if we have followed orthodontic history carefully, we will recall that the bite plane of Kingsley was thrown into the discard, the spurs and planes on molar bands suggested by Angle for retaining the normal mesiodistal relation-

ship after treatment of Class II were rejected as useless, the original pin and tube appliance went into innocuous desuetude, and yet here today the essayist has practically picked each of these mechanisms from the scrap heap, melted them over in the crucible of skilled experience, and presented them to us in their perfection of mechanical design and utility.

So much for tribute which is well deserved, and which I am glad to pay to one who has by his perfection of results in treatment, lifted mechanics in orthodontia to a plane equally important in my estimation with that of theory of causation of malocclusion, of biologic manifestations of growth and development, of pathologic symptomatology of disease or deformity, et al.

There has been a growing tendency to decry mechanics in orthodontia, and I am here given the opportunity of a digression to take a fling at the ultra theorists who continually depreciate mechanics in orthodontia and, soaring above the clouds to the *n*th heaven of theoretical formulae in their airships of bubbling hydrogen, are apt to forget that there is anything of value in mechanics, not realizing that the framework and supporting structure of their airships are all mechanically adjusted, and that the slightest break in their continuity may mean the speedy dissolution of their dreams.

There is a book entitled "If Winter Comes," founded on the line of a verse which reads, "If winter comes can spring be far behind," and to use this analogy in the distinction between the theoretical conception and the mechanical practice in orthodontia, one can with becoming deference to theory word the phrase to read, If the winter of theory comes, can the spring of mechanics be far behind. (The pun was not intentional.)

As a natural precedent to his technic of treatment of the first division of Class II, or distoclusion, the essayist touches slightly upon the diagnosis of the particular malocclusal manifestations which he so beautifully corrects, and refers to the paucity of our terminology and the inadequateness of our classifications of malocclusion which do not allow us definitely to apply terms to such variations of malocclusion as are described in the paper.

If the diagnosis of these cases which the essayist has shown could have been made through the use of facial landmarks and planes suggested by Dr. Simon, I believe that the facial balance might have been secured to a little better degree than shown. However, this is beside the theme of the paper and is only suggested as comment, not criticism.

If there is any question in the essayist's mind as to his diagnosis of the particular arrested developmental conditions in the distoclusion cases which he illustrates, it is probably due to the fact that our subclassifications, so to speak, in distoclusion, and the terminology to fit them are not so specifically differentiated and defined that one can readily refer to them in terms which are so readily understood as to be in present general use.

To speak of all mandibular malocclusal manifestations or variations as "micromandibular deformities" in those cases in which there is a diminution in development of the mandible does not definitely enough define the particular variation which the essayist is discussing. However, I find myself in agreement with Dr. Lischer in the use of this general term, and only hope that his terminology complex will continue to work and supply us with still more definite terms for these variations even though they are not simple.

It is evident from a recent criticism of the last revision of my chapter on orthodontia in Johnson's *Operative Dentistry* that an author dare not use simple understandable terminology in a textbook intended largely for the dental practitioner without being thought unscientific or unprogressive. This is in answer to a criticism of my friend, Dr. Suggett, who, in his address as president of the Pacific Coast Society of Orthodontists, expressed disappointment that I used the old terminology in this chapter on orthodontia.

Let me make myself clear in this matter by saying first that the author of a teaching textbook has to consider the ability of his readers to understand and assimilate new terminology, and the dental practitioner, for whom this chapter was written, is not so well prepared by four years of preliminary coaxing to swallow the bitter pill of new orthodontic terminology as are the members of this society, 90 per cent of whom couldn't define a "micromandibular deformity" or a "mandibular retroversion" without looking up some of the prefixes in a Latin dictionary.

I was interested in observing the attempted use of the newer terminology this morning by three of our veteran orthodontists. One used the term "mandibular second bicuspid," another, "mandibular second premolar," while still another said "lower second premolar."

So there are others who are not yet so used to the new terminology that it flows correctly and smoothly from their lips.

Again, you cannot make a terminologist of any one by giving him "a shot in the arm" of such strange dope as a new terminology. He has got to get used to it a little at a time, "even as you and I." A paper which I wrote several years ago on Class II contained the adjectives "upper" and "lower," referring to incisors, cuspids, et al., and when the proofs came back from the editor of the *International Journal of Orthodontia* the words "maxillary" and "mandibular" had been substituted by the kindly intentioned and overzealous terminologist of a proof reader, and these words recurred in the paper so many times that I was forced to request the editor to change them to the original simpler words "upper" and "lower" so that I could understand my own paper, as it were. It is unfortunate for the dental reader, yes, and for the orthodontist, that we have to fill up our papers and textbooks with high sounding words or phrases no matter how accurate they may be or how learned they may sound, and apparently for the benefit of the anthropologist or biologist or other ologist who seldom reads our literature. It reminds me of the editorials in a newspaper which refer to "a celebrated Philadelphia divine," meaning a minister of the Gospel. One witty individual made the comment that "a celebrated Philadelphia divine" was a minister who received over ten thousand dollars a year salary. "Simplicity is a cardinal virtue" in writing understandable papers or textbooks, as in everything else.

If Dr. Suggett had observed carefully, he would have noticed that the simpler and more easily understandable part of the new terminology was actually included in the chapter in question, and he will also observe that a full and satisfactory dose of the new terminology will be included in a new book on orthodontia which I expect to publish soon for the orthodontist.

Dr. Hellman has discovered three kinds of normal occlusion, each of which require special terminology for their differentiation. Dr. Lischer periodically discovers a new or unusual dentofacial deformity which requires a new Latin name. Now, we all love our terminologists, but we sincerely trust that they will get on a terminology diet until their terms are assimilated and come into more common use.

If you will pardon this digression from the discussion of the paper, I shall take up that phase of the paper proper in which the use of inclined planes for the immediate forward posing of the mandible, or the "jumping of the bite" in these cases is recommended. There seems to be a tendency at the present time to use the inclined plane lingually to the upper incisors in distoclusion cases for this purpose rather than to treat these cases by means of intermaxillary force, or the so-called "Baker anchorage."

The pendulum has swung somewhat the other way today, and intermaxillary force is much less used than formerly, while the inclined plane, both in the incisor region, and on molar bands for the immediate forward posing of the mandible, seems to have come into its own as a valuable and indispensable mechanism in the treatment of this class of cases.

The chief advantage in the immediate forward posing of the mandible in its normal mesiodistal relationship with the maxilla lies in the early initiation of normal function of the weakened and formerly malposed muscles of the mandible, which finally gain their full growth and development through muscle training along the lines laid down by Dr. Rogers.

It is obvious that the normal size and shape of each dental arch must be established, and each malposed tooth brought into alignment before the inclined planes are adjusted for the immediate forward posing of the mandible in these distoclusion cases regardless of what method is used in this preliminary treatment.

I am certain that in many cases of distoclusion bodily movement of the teeth is indicated, and in these cases the pin and tube appliance as described by the essayist, as well as the incisor and molar inclined planes, represents ideal treatment for these cases. I am equally certain that in many other cases of distoclusion inclination or tipping movement of the teeth is indicated and, therefore, a much simpler appliance, such as the loop inclined plane lingual to the upper incisors, attached to a lingual arch with an auxiliary labial arch with loops crossing the labial portion of the upper incisors and cuspids, may represent ideal treatment for these cases.

The essayist has made a valuable contribution in the measuring of the pitch or angle of the incisor planes, which, if constructed of proper materials and with the very steep pitch

at the beginning of treatment, will save much time and effort in reconstruction to get the proper pitch after treatment with a lesser pitch has proved insufficient.

As far as I know, Dr. Grieve is the first one to call attention to the growth stimulating influence of properly designed incisor planes throughout the length of the mandible, "from the condyles to the most distal tooth attached to the arch wire upon each side." He says, "It is not yet known just what takes place, but in the use of this method in the treatment of these cases, the mandible seems to become longer from the condyles to the symphysis."

I might venture to suggest that the perfection of design and position of these incisor planes as made by the essayist effectually secures the normal forward posing of the mandible, allowing the normally free functionating of the mandibular muscles, and consequent completion of growth and development of the mandible itself.

The results of the experimental research work of Dr. Grieve in connection with the biomechanical problem involved in the successful treatment of these distoclusion cases have shown rather conclusively that the use of the steepest planes that could possibly be used, in conjunction with an appliance which prevented the teeth from the tipping, "were the most efficient in stimulating growth in the length of the mandible from the symphysis to the condyles."

The essayist is very modest in his claim for non-originality, but I shall have to remind him that his methods are at least unorthodox and revolutionary, and unless I am overruled, some of his methods are original. For example, the plan of equalization of the dental arches, correcting the mesiodistal relations, and the excessive overbite at the same time, rather than in sequence as is usually done, seems to me to be original and revolutionary, and the saving in time tremendous.

His reversion and conversion to the obsolete molar planes, revamped and reconstructed, for retention of these cases seems like finding a long lost trail, which, when reblazed by the light of the experienced traveler, leads on to plains of high adventure.

From the perfected incisor and molar planes of the essayist to the vulcanite plate and plane of Kingsley for "jumping the bite" is a far cry. For emphasizing the sterling worth of the principle of the inclined plane in "jumping the bite," thereby laying the foundation for the successful treatment of these deforming malocclusions, we lay another wreath upon the grave of our beloved Kingsley; for the perfecting of this principle and the development of an apparently perfect technic for the treatment of these difficult cases of distoclusion we give thanks to and congratulate the essayist as a slight token of our appreciation of his distinctive achievement.

Dr. M. N. Federspiel.—This wonderful paper of Dr. Grieve's relating to the treatment of distoclusion is, of course, debatable for this reason: He has not impressed upon us just what he means by distoclusion, unless he depends on antique and obsolete methods of making a diagnosis from the position of the inclined planes. The literature of today and of the past is so full of material pertaining to diagnosis and differential diagnosis, and it has been discussed so freely and so clearly, that we should be a little more careful in diagnosing the position of the mandible, whether it is in retroversion or the lower teeth in distoclusion, or whether the case is a maxillary protraction or a maxillary retraction. Mandibular retroversion has never been given the consideration that it should receive. A number of years ago I presented a paper before the society wherein I demonstrated with a number of specimens showing the embryologic development of the temporomandibular articulation. I couldn't get you to look at them because they were the specimens of the dead. You were not interested in anatomic wet specimens, because you had become habituated in making a diagnosis from plaster of Paris models. When I attempted to demonstrate and prove to you that the glenoid fossae at birth is flat, that the temporomandibular joint develops in proportion to the eruption of the teeth, and that any change in the position of the teeth and the position of the mandible will also change the position of the temporomandibular articulation,—I did not get an audience. Naturally, I became disheartened from this lack of interest in a subject that required much research, labor and time. If you are perfectly satisfied to play with plaster models, and have no interest in anthropologic studies, you can never hope to advance in dental science.

Dr. Pullen in his discussion speaks of numerals, and still relies on the Angle classification for diagnosing malocclusion and dentofacial deformities. I have been under the impression that scientific men are considering this method of diagnosing as obsolete, and

why should we still stick to numerals which are usually applied to tin cans, kettles, door locks and latches?

Many years ago Dr. Bright was the discoverer of albumin in the urine, and this abnormality was called "Bright's disease." Since that time we have advanced and we know that Bright's disease is a misnomer, as it does not determine what factors cause the formation of albumin in the urine. It may be due to irritation caused by a stone in the kidney, or it may be interstitial nephritis or globular nephritis. Bright's disease does not determine just what the pathologic condition is; we have to be more specific. Neither can we go so far as to say that a man who has a temperature is suffering from a Class Number II fever. It is not specific, for fever may be induced by pneumonia, typhoid and many other manifestations. Neither can you speak of pulpitis as toothache Number 7, or as Class Number 3 toothache. (Laughter.) Therefore, it is important that we should be very careful in our terminology, and one who does not apply his terminology correctly to a diagnosis, prognosis and a differential diagnosis, cannot be very successful in the treatment.

President Howard.—Is there anyone else who wishes to discuss this paper? (There was no further discussion.) Dr. Grieve, will you close the discussion?

Dr. George Grieve (closing).—I am extremely flattered by Dr. Pullen's discussion of my paper, and I only hope I may be worthy of some of the nice things he has said about me.

I was reminded by some of the members sitting near me of one point which Dr. Pullen did not stress, that the great factor in this method of treatment is the prevention of tipping of the teeth. The idea I had in mind in adopting dear old Dr. Kingsley's method of "jumping the bite" was that with the pin appliance, we get the maximum anchorage, whereby we are able to bring the mandible forward and maintain the normal occlusal relations until such time as Nature is able to build the mandible to its normal size. Maximum anchorage and the prevention of tipping of the teeth is the chief factor. By the method I have outlined we get very little movement of the teeth. There is no doubt that we must get some, but I feel that the amount is infinitesimal.

I remember, very clearly, Dr. Federspiel's presentation of which he spoke. Personally, my trend has always been mechanical. I admire men such as Drs. Federspiel, Lischer, Hellman, Johnson and other men whose trend of ability runs along theoretical lines. I think it is a great thing for us to have them, but at the same time we must not forget the mechanical aspect of orthodontia. When these men take us into the maze of the unfathomable depths of the forest, some one must find the way out, and I have tried, in the type of case which I discussed, to do that. Dr. Federspiel did not; he left us in the bush without a compass. That is why he was discouraged, and felt that his efforts were not appreciated. I hope I will not, also, have to go home discouraged in the same way. Thank you very much.

Dr. M. N. Federspiel.—Apparently I did not make myself clear yesterday. Since you have heard Dr. Lischer talk about gnathostatic measurements, I would like to clarify what I said about Grieve's method. I don't want you to go away thinking that I am inclined to criticize Dr. Grieve's method of treatment. No doubt, his method is all right if his diagnosis is correct, but I would like to have him differentiate between a distoclusion and a mandible retroversion. Therefore, before I attempt to adopt Dr. Grieve's treatment, I would like to make use of the Simon method of measurements in order to satisfy myself what abnormality I had to deal with. It is quite a problem to differentiate an alveolar retraction from a dental retraction, or from a mandible retroversion. The Simon method, I think, today is the only method by which we are more sure in making a diagnosis and differential diagnosis, and under his method we are far more able to determine the kind of treatment that is to be applied.

President Howard.—Does anybody else wish to discuss the paper before the slides get here?

Dr. G. W. Grieve.—I did not have the advantage of hearing Dr. Simon's paper, nor had I seen the published report of his work at the time my paper was prepared. Some of the profile photographs shown by me had a perpendicular line drawn upon them, merely to enable one to visualize the relation of the mandible to the rest of the face. I feel that Dr. Simon's method is a very valuable aid in diagnosis, but probably entails more expenditure of time than is necessary, as a skilful orthodontist can pretty well trust his eye in the study of balance of the facial outline.

DOES BONE FORM FROM OSTEOBLASTS OR FROM A METAPLASIA OF THE SURROUNDING CONNECTIVE TISSUE?*

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OPINIONS vary as to the rôle played by the different tissues of bone in its regeneration. One investigator may regard the periosteum, another the endosteum, and another the cells of the bone itself, as the important factor in the union of fractures, in the correction of defects, and in the obtaining of satisfactory results in transplanting bone. It should be mentioned that there are investigators who regard the periosteum, endosteum, or bony cells themselves as capable of producing bone and that the other tissues of the bone have no function whatsoever. However, there are some men who believe that the formation of bone after trauma, etc., and in transplants, is dependent largely and sometimes entirely on a metaplasia of the surrounding connective tissue.

In our study we have endeavored to determine two points:

1. What rôle the different elements of bone play in bone regeneration.

2. What the possibilities are for bone regeneration from metaplasia of the connective tissue.

I. THE RÔLE OF THE DIFFERENT BONE ELEMENTS IN BONE REGENERATION

In contradistinction to the "physiological regeneration," there is, with the regeneration which starts as a result of tissue stimulation, an "accidental or pathological regeneration," which is the change in the tissue caused by external damage of some kind (infection or injury). The difference between the two forms of regeneration is basic and depends upon these factors: In physiological regeneration the used and lost tissue substance is constantly replaced in a typical way; in the pathological regeneration a complete anatomical replacement is never attained even if an attempt is made to replace functionally the lost or damaged tissue. The most complete regeneration is found in the replacement of injured parts of the connective tissue of blood vessels. The specific organ or tissue to which bone belongs as a whole is of such a nature as to make the normal regeneration of bone impossible.

These basic principles, which are true for all pathological regeneration, also apply in all healing processes which are the result of injury or trauma to bone. At best the end-result may show a very nearly normal bone in form and structure (complete regeneration), or it may show a bone which is more or less abnormal in form (incomplete regeneration), but which gives good function. The amount of regeneration attained depends directly upon the extent to which

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the blood vessel connective-tissue apparatus of the organ or tissue is disturbed through the damaging influence of the process following injury or infection, so that it is important to remember how essential it is to preserve the blood supply and to avoid changes in the blood vessel apparatus of the bone in question which might result from a manipulation to obtain a complete anatomical and functional result.

Lexer has repeatedly emphasized the great importance of this knowledge. According to Lexer, as a result of injury, the blood vessel system of the bone involved reacts by filling the blood vessels and new blood vessels are formed. These processes follow one another with the constancy of a law of nature. As a result of hyperæmia all the functions of the involved bone are increased, and, with this, the regeneration changes begin. Through the hyperæmia the organism prepares for regeneration; the tissues at the site of, and surrounding, the injury securing nutrition to the part and the replacement of material and removal of waste products. In addition through the disturbance of the processes inaugurated by the hyperæmia, the hyperæmia is further maintained through the products of destruction and the blood. The causes of regeneration in chronological order are: trauma, hyperæmia, and products of tissue destruction. Their results are: hyperplasia, proliferation, and hypertrophy of the specific and non-specific tissue elements, which, under normal conditions, develop into fibrous scar tissue or a pseudo-arthrosis.

To determine the rôle the different bone tissues play in bone regeneration, a series of experiments were performed with each tissue of the bone, that is periosteum, endosteum, and the compact bone. Always just the one tissue was tested, the other two were destroyed. At the same time in each series, the blood supply to the tissue to be tested was kept intact, while that going to the other two tissues was damaged. The influence of the *age* and *function* was also considered.

With reference to the series of experiments to test the ability of the periosteum to regenerate, a few fundamental facts must be noted. The periosteum is built up of two layers: the outer layer, the adventitia, is made up of connective tissue rich in blood vessels and serves as a connection between the surrounding tissue, provides for the most part the nourishment of the bone, and serves as a delimiting membrane; the inner layer, the fibro-elastica, or cambium layer, is poor in blood vessels, consists of elastic fibers running in the long direction of the bone and round, spindle-shaped connective-tissue cells, also connective-tissue fibers and presents on the side toward the bone a layer of cortical cells with round, dark colored nuclei (osteoblasts). The periosteum is bound to the bone by the interlacing of blood vessels in and out of the bone into the periosteum, through bundles of connective tissue (Charpey's fibers) and by means of elastic fibers. This union is loose in growing and young adult animals, but it is quite firm in full grown and especially in old animals. The fullness of the blood vessels in the bones decreases with age. As the real specific layer capable of regenerating bone is the cambium layer and as it receives its blood supply from the adventitia (the blood vessels coming through the compact bone from the marrow canal are of little importance), it is clear, that for bone regeneration, both layers, and in proper relationship,

are necessary. It is clear too that the adventitia should not be separated from the surrounding soft parts, because from the soft parts the blood vessels penetrate into the adventitia. On the other hand, it is not necessary for periosteal regeneration and bone production that there be union between the cambium layer and the compact bone. In doing the experiments and in estimating the results, it is important to keep the cambium layer, adventitia and surrounding soft parts of the bone (fascia, muscles, and connective tissue) in their natural relationship. This can be done only if at operation the compact bone (ulna or radius) is exposed by an incision made by a sharp knife, and the work is done through this incision. The periosteal tube, together with its surrounding tissues, is separated by sharp dissection from the compact bone (Lexer).

At operation we worked from the radial side of the forearm toward the radius, or, in other cases, from the ulnar side toward the ulna, taking the greatest care not to disturb the soft parts. After separating the periosteal tube together with the soft parts for 1.5 to 2 centimeters, the compact bone and marrow were removed by sawing the freed bone through at both ends, curetting the marrow canal of the bone remaining at each end with a sharp curette, or plugging each end (in order to exclude the myelogeno-endosteal bone regeneration). Following this, the periosteal tube with its nutrient vessels undisturbed and the soft parts were carefully sutured. In other experiments, under the same conditions, only one-half of the periosteal tube was left and the other half removed. In these cases the ends of the bones were not united by means of a periosteal tube but by half a periosteal tube which was not sutured. The marrow canals were curetted, and the soft parts sutured. In other experiments the radius or the ulna with its surrounding periosteum would be freed for about 2 centimeters from its surrounding soft parts. From this piece of periosteum and bone, completely freed from its surroundings, a piece of bone 1.5 centimeters long, including the marrow canal, was sawed out subperiosteally and the marrow canals of the ends remaining filled with an autogenous piece of compact bone (without periosteum and no endosteum). This periosteal tube, which had been completely separated from its surrounding soft parts was sutured and the soft parts closed. In these experiments the bone ends were united by means of a periosteal tube which covered the bone ends, but the tube had been separated from the soft parts and, therefore, was separated from its blood supply.

In our experiments on old animals we were never able to obtain bone regeneration from the periosteal tube. Lexer has pointed out that on account of the union between the cambium layer and the cortical layer in adult bone, the separation of the periosteum from the bone is difficult and, under normal conditions, is extremely unsuccessful. According to Lexer, it is for this reason that bone regeneration is unsuccessful in these experiments. Axhausen believes that the periosteum of full grown animals cannot produce bone, because it has exhausted the power to do so. By means of infection or trauma, according to Axhausen, it can be stimulated again; in these cases the stimulus for growth comes from necrotic bone next the periosteum. Bier and his school consider that in such cases there is a hormone coming from the living bone which influences the periosteum to regenerate bone. According to Lexer there

is a growth stimulus which comes from the necrotic bone and works upon the osteoblasts. However, the main cause for bone regeneration is to be sought in cases in which the periosteum and bone are united, for between the periosteum and the compact bone, where the cambium cells are retained, bone regeneration takes place. From these facts it develops that under the usual experimental conditions *the periosteum of old animals does not form bone.* For the development of its bone building power, the blood supply which comes from surrounding tissue must not be destroyed so that the hyperæmia from the fracture may reach the cambium layer. Following our line of reasoning—that by retaining the natural union between the periosteum and compact bone, even in old animals, where the retained cambium cells produce bone—we exposed the compact bone in old animals by means of an incision in the usual manner, loosened the periosteum a little from the compact bone, and through this opening of the periosteum removed the cortex with a Luer rongeur so that only a small part of its outermost layer was in contact and remained with the periosteum. The marrow canals were curetted as usual. Viewed from the incision one could see the periosteal tube with small pieces of cortex clinging to the periosteum which was united with the surrounding soft parts. At these places where the bone clings to the periosteum the cambium layer was retained. The periosteal tube and soft parts were sutured as usual.

In other cases in old animals we studied the periosteal regeneration processes after the compact bone and endosteum had been removed. Preceding operation the periosteum was stimulated through trauma. Lexer has pointed out that in old animals such a traumatically stimulated periosteum with its layer of osteoid and cambium cells is easily separated from the cortex. Following Lexer's experiments we produced subcutaneous fracture of both forearm bones in old animals, and put the limb at rest in a plaster-of-Paris splint. After 8 days, the splint was removed and from the middle of the radius a cylinder of bone marrow and endosteum was resected in the usual way, the cylinder containing the site of the fracture. We show, as Lexer found in his experiments, that in the region of the fracture the periosteal tube which just above and below was thickened by callous formation was easily separated in the region of this callous formation from the cortex. As a result of the extraordinary fracture hyperæmia in these experiments, the bleeding was quite marked at operation, the opposite of what had occurred in previous experiments. Also, in this series of experiments the marrow canal at both ends was curetted, and the periosteal tube and the surrounding soft parts sutured. A plaster-of-Paris splint was worn for 4 weeks.

At the same time certain preliminary remarks with reference to the series of experiments determining the bone building power of the endosteum must be made. A separate discussion of endosteum and marrow is not necessary, as first, both are in intimate contact so that it is impossible to separate them without disturbing them; and, second, the endosteum is nothing more than a very thinly developed fibrous membrane of the marrow which is attached to the compact bone and completes the lining of the marrow canal. The endosteum is furthermore built up of connective tissue, blood vessels, and cells. The endosteum consists of one layer of flat or cubical cells (osteoblasts) and

fine, connective-tissue bundles. Connective-tissue fibers traverse the whole marrow canal; elastic fibers are absent. For our investigation the marrow cells are of no interest, but the osteoblasts, osteoclasts, connective-tissue and fat cells are of importance. In our experiments we could convince ourselves that in the diaphysis of young animals there was red, myeloid marrow, and in the diaphysis of old animals yellow, fatty marrow. Quantitatively the osteoblastic tissue in the marrow endosteum was more abundant than that in the periosteum. The blood vessel supply of the marrow endosteum according to Lexer's investigations in young animals comes from four sources; first, through diaphyseal circulation of the nutrient artery; second, through blood vessels of the metaphysis; third, through blood vessels of the epiphysis; fourth, through anastomoses which come from the periosteal vessels and pierce the cortex. In young subjects there are, especially at the period of greatest growth, profuse anastomoses between the blood vessels and marked filling of the blood vessels. After this growth has completed itself, this hyperæmia subsides, so that the endosteum of the marrow is cared for only by the delicate nutrient artery and isolated anastomoses between metaphyseal and epiphyseal blood vessels.

It is of the greatest importance to injure the endosteum of the marrow as little as possible. At first we attempted by means of a small rongeur to remove the compact bone from the endosteum cylinder. It was impossible with this technique to prevent the tearing or crushing of the endosteum by the instrument or pressure from the splinters. For this reason we employed the following technique: with its periosteal covering, the bone in question (ulna or radius) was exposed. After this, the surrounding soft parts, in the region of the defect, were scraped with a sharp knife and spoon, in order to remove with certainty the small pieces of remaining periosteum clinging to the soft parts. If the nutrient artery was to be retained, the defect was placed distal to the nutrient canal, and furthermore the place of entrance (in the radius and ulna in the middle of the diaphysis and on the ligamentum interosseum, in the tibia in the upper third and behind) was protected, because the periosteum remained in union with the bone and surrounding soft parts for some distance. If the nutrient artery was disturbed, the vessel was torn at the place of entrance through the loosening of the periosteum. The upper and lower ends of the bone to be removed were sawed with a fine saw on the opposite and near side so that the innermost layer of bone was intact. This gave four places where the bone was sawed through almost to the endosteum (two above and two below lying opposite each other), between which the bone and its periosteum were to be removed. In case a larger defect is to be made, the bone is sawed midway between the upper and lower saw lines on the inner and outer side. Now a flat chisel is used and inserted in the saw lines at different places tapping it gently each time, so that the fragment of bone to be removed is not displaced but so that the inner layer of remaining bone is just cracked. In this way the bone with its periosteum can be easily removed without damaging the cylinder of endosteum in any way. There remain the two bone stumps united by the undisturbed cylinder of endosteum containing the marrow. The periosteum on the stumps is scraped off in order to prevent it from taking

any part in the formation of bone. After this the soft parts and skin are carefully sutured.

It has been pointed out that on account of the defect the fragments are movable and, as a result, the keeping of the cylinder of endosteum intact is endangered. Certainly this danger is present, but in a series of experiments the danger can be minimized by applying plaster-of-Paris splints, and in another series the danger can be increased by treating the defect without splints. We emphasize especially that we have regarded only those cases worthy of consideration in which the marrow endosteum cylinder lying free in the bony defect remained undisturbed until the wound was sutured. We are also of the opinion that the delicate cylinder of endosteum and marrow may be damaged by the pressure of the soft parts, through the movement of the fragments and through the play of the muscles. Especially great are these dangers in those cases in which, from the beginning, the extremities are handled without a plaster-of-Paris splint and are allowed to move unhindered. in an injection preparation, Lexer could show, as a result of these conditions, that in contrast to the marked periosteal hyperæmia of the compact bone stumps, the free lying marrow endosteum cylinder was not at all or very poorly supplied with collaterals. These fundamental facts are of great importance for the understanding of the whole process.

In a third series of experiments, we followed the bony building process in which the periosteum, as well as the marrow and endosteum, was removed from the bone and only the compact bone remained. For this purpose in the middle of the bone to be tested a circular strip of periosteum, 2 centimeters long, would be removed. Then the anterior half of the bone would be sawed off and the marrow and endosteum in this region taken out. In such an experiment there would be a piece of compact bone about 2 centimeters in length completely robbed of its periosteum, marrow, and endosteum, the central and peripheral ends being undisturbed in their union with the remaining bone.

In a series of experiments, the healing processes in total defect of bone were followed. In these cases 2 centimeters of the bone were resected (removal of periosteum, compact bone, endosteum, and marrow), and at the same time the periosteum and the nutrient artery of the stumps destroyed; in other cases these were left intact.

With reference to function, the following holds good for all the experiments. From the beginning, in all cases, we have allowed the bones to have functional rest so that this stimulus plays the same rôle in all the experiments. On the other hand, the stimulus resulting from the voluntary and involuntary action of the muscles, is removed as far as possible by means of a plaster-of-Paris splint which is left in place for 4 weeks. This splint places both of the neighboring joints at rest. When no plaster-of-Paris splint is applied, the joints have full freedom of motion. When the degree of functional rest is the same, we have a series of cases in which healing goes on with the mechanical stimulus removed by means of a plaster-of-Paris bandage during the first weeks of healing, and another series in which the stimulus has not been removed and acts from the beginning, but as a result of the natural splinting afforded

by the sound bone parallel to the fractured bone the fragments are given good protection against displacement. All the animals (dogs, cats, and rabbits) bore their weight on the extremities operated upon from the beginning and ran around in 2 to 3 days. For our purpose, we completed only those experiments in which the wound healed by first intention. All the cases were frequently X-rayed in order to follow the regeneration processes. When the animals had a plaster-of-Paris bandage, it was removed in order to take a roentgenogram and was then replaced immediately. At the end of the experiments, which were interrupted at different intervals, the experimental material recovered was carefully prepared and a macroscopic and microscopic examination made.

The results of these experiments will be considered separately under the different headings.

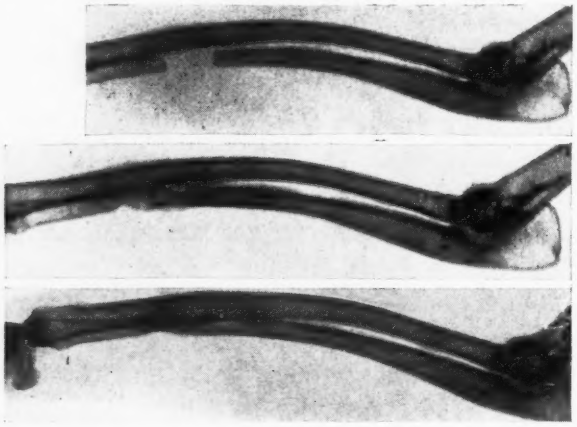


Fig. 1.—Circular compact bone, marrow and endosteum defect of ulna in young rabbit. Artery destroyed and marrow canal curetted. Roentgenograms taken immediately after operation and 12 and 82 days later.

1. THE RÔLE OF THE PERIOSTEUM IN BONE REGENERATION

Our experiments showed that the periosteum plays a most important rôle in the regeneration of bone. It might be concluded that the normal union of the different layers of the periosteum (cambium layer and adventitia) is necessary for bone regeneration.

As a typical example, the X-ray pictures and the histological preparation of such an experiment might be described. With a technique corresponding to our previous description, a circular piece of compact bone together with marrow and endosteum was subperiostially removed from a young rabbit, and at the same time the nutrient artery was destroyed and both marrow cavities were scraped. The periosteum and soft parts were sewed in the usual manner, and a plaster-of-Paris splint applied and worn for 4 weeks. The roentgenograms (Fig. 1) show the defect immediately after the operation, and 12 and 82 days after operation. Twelve days after operation the two fragments are seen to be united by a continuous shadow, which still shows lighter areas. The radial side of the ulna shows (above the operative area) a long, narrow shadow, which in the region of the operation, is united with a similar long strip of the radius. In the roentgenogram taken 82 days after operation, both bone stumps are united by means of a thick, well formed, callous mass which on the outer side of the radius still shows a concavity. The marrow cavity in this callous mass has not been formed. Radius and ulna are united by means of a bridge-like shadow. In the microscopic preparation (Fig. 2) there is a periosteal,

callous mass with an outer layer of compact bone and an inner spongy layer containing newly built marrow spaces. This callous mass is united with the ulna so that the union is scarcely recognizable. The finer microscopic structure of this periosteal, callous mass, just as in the macroscopic, is well formed and the static relationship is already well begun by means of the arrangement of the long lamellar system in the outer layer and by the outspread lamellar system unevenly distributed through the more spongy layer by resorption. In the outer layer, the architectural structure of the newly built cortex is completed; in the inner layer the destruction of the superfluous bone areas is still in process. Through the activity of the osteoblasts and osteoclasts of the regenerating marrow, the marrow canal of the central fragment in the preparation is pushed finger-like into the periosteal callus; in the peripheral fragment the canal is already open and united with the marrow spaces of the periosteal callus. Furthermore, one can see in the preparation how periosteal, callous masses have formed bridges between the radius and ulna. Those bridges are probably formed by mechanical stimulus.

With these bone regenerative processes, no stimulus due to hormones comes into play, as regeneration is possible only because the cambium layer is united with its adventitia which carries the blood vessels and nourishment and thus makes it possible to secure a hyperæmia which reaches the osteoblasts. With bones, it is the same as with all other tissue and organs: life, function,

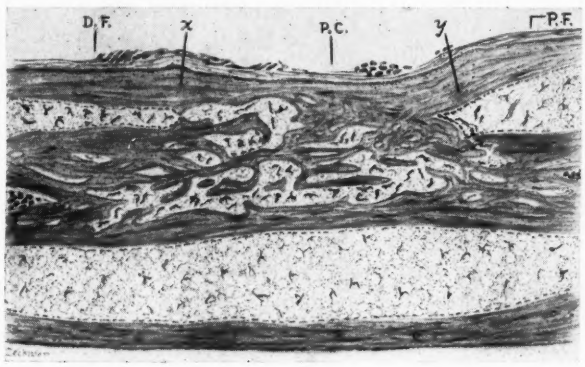


Fig. 2.—Drawing of section of bone in experiment shown in Fig. 1 showing *P.C.*, periosteal callus in defect; *X.Y.*, site of operation; *D.F.*, distal fragment; *P.F.*, proximal fragment; *U.*, ulna; and *R.*, radius.

and regeneration are possible only so long as the circulation leading to the tissue in question is intact.

Beside the undisturbed union of adventitia and cambium layer, there is necessary for the same reason, union of the adventitia with the surrounding soft parts. We could show that a periosteal tube separated from its surrounding soft parts could build no bone, but that it showed in all its parts (cambium layer and adventitia) fibrous degeneration.

Here we can also show a typical case. In a young cat, we removed a circular piece of compact bone with the marrow canal and endosteum, we destroyed the nutrient artery and plugged the marrow canals of each fragment with autogenous compact bone, after the periosteum had been loosened on all sides from the soft parts. The ends of the bones in this experiment were united by means of a periosteal tube which was sutured continuously and freed on all sides from the soft parts. Roentgenogram 3 shows the defect immediately after the operation and 2 months later, at which time we find that the atrophic stump ends without any callous formation. In the histological preparation (Fig. 4) one can recognize that bone formation has stopped wherever the outer side of the adventitia has been separated from the soft parts. From here, toward the defect and in the defect itself, there is only a fibrous connective tissue rich in cells, the fibrous elements of the fibro-elastic layer and

adventitia, while the cambium layer itself is no longer demonstrable. At the ends of the stumps and in the atrophic plugs, there is present a very meager myelogeno-endosteal callous formation. In the formation of the connective tissue in the defect, in addition to the fibrous degeneration of the periosteum, there is the surrounding nonspecific fibrous tissue.

While the bone-building power of the periosteum of younger animals is generally acknowledged, it is disputed by Bier and his school as in the case of the periosteum of older animals, in so much as the periosteum is not stimulated from the marrow or cortical bone to regeneration by means of a hormone. Contrary to this, we were able to confirm the views of Lexer and others that the bone building powers of the periosteum of older animals is not destroyed,

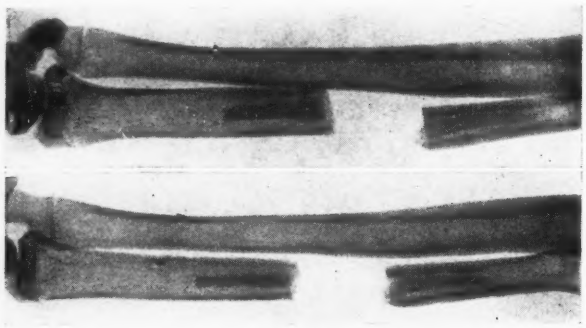


Fig. 3.—Circular bone marrow and endosteum defect of radius in young cat. Artery destroyed and marrow canal plugged with living autogenous bone Roentgenograms taken immediately after operation and 2 months later.

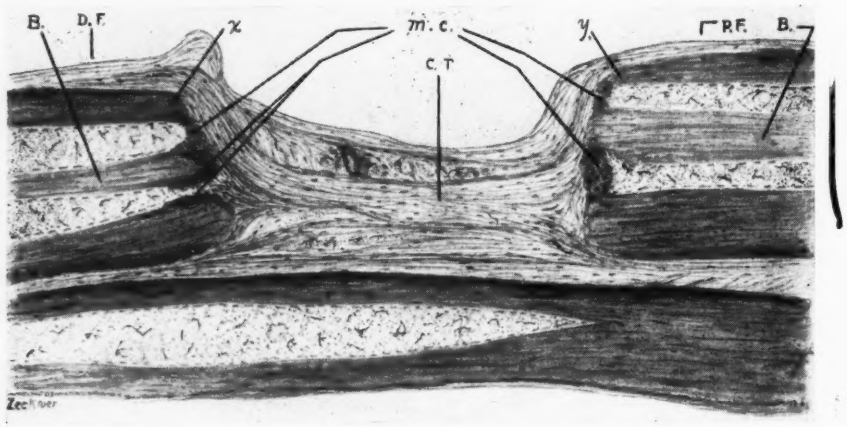


Fig. 4.—Drawing of section of bone shown in Fig. 3, showing *B.*, compact bone; *D. F.*, distal fragment; *X. Y.*, site of operation; *C. T.*, connective tissue of defect (periosteum and connective tissue of vicinity); *M. C.*, callus of marrow canal; *P. F.*, proximal fragment; *R.*, radius; *U*, ulna.

but that it begins in the same way when the conditions for the cambium layer remain the same as in the young animals: its course is, because of the slowing up of all regenerative processes, somewhat slower. In older animals one of the experimental conditions we were not able to retain in the periosteal tubes was the necessary union between the cambium layers and the adventitia. In subperiosteal resection in old animals, the cambium layer remained, for the most part, on the compact bone and so was removed when the bone was removed. As we have already explained, in these cases there was no bone building just as has been reported by other authors. In these experi-

ments bone building took place only where the periosteum was not separated from the compact bone, and it grew just as in the case of younger animals. In such experiments on old animals we made a histological investigation of the removed cortical bone and demonstrated that everywhere on its outer surface, osteoblasts were present. At the same time small pieces were excised from the periosteum and only occasional cambium cells were demonstrated histologically.

These processes are shown in Figure 5. In an old male cat, we resected subperiosteally from the right radius, a cylinder of compact bone, marrow, and endosteum, 1.5 centimeters long, and sutured the periosteal tube and the soft parts. In Figure 5 we see the defect immediately after the operation and 39 days later. Here the stump is atrophic, but there is no callus formation. Distalward from the incision on the peripheral fragment there is, just opposite the ulna, a small exostosis. Histologically, there are periosteal callosites on the stump ends, while in the defect there is a fibrous scar which closes the marrow canal.

It is to be expected, that in old animals, when it is technically impossible to keep the cambium layer in union with the adventitia, periosteal bone regeneration in the defect will not occur. In histological preparations of such cases, there

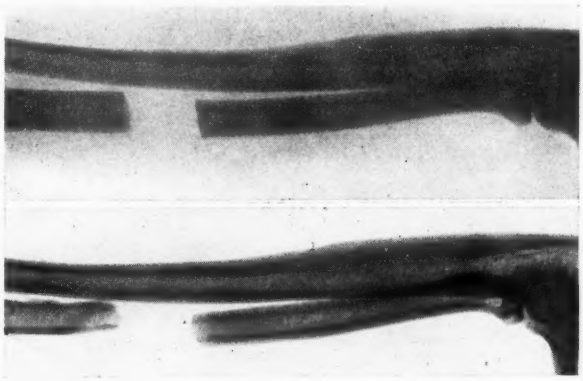


Fig. 5.—Circular compact bone and marrow and endosteum defect in radius of old male cat. Artery of proximal fragment retained; of peripheral fragment destroyed. Roentgenograms taken immediately after operation and 39 days later.

is found, as explained, periosteal bone building on the outer surfaces of the stumps. From this there would seem to be special relationships or conditions present. In such experiments one should remember that conditions are produced which correspond only in part, or not at all, with natural or normal conditions. The negative results in these cases are the opposite to those found in bone healing in older people, in whom just as in young people, there is a marked periosteal callus formation, although the process is somewhat slower. An injury which produces a fracture never causes so marked a separation between the cambium layer and the adventitia as occurs in experiments in which a subperiosteal resection is performed in older animals. The natural union of both layers remains, entirely or almost entirely, intact in the largest number of cases.

If we compare these results with our experiments, we find that even in old animals, when the natural contact between the cambium layer and adventitia is maintained, periosteal bone regeneration takes place exactly as it does in young animals, only the process is slower.

To illustrate, the pictures of an experiment may be described. In this experiment, a periosteal tube was made which had small splinters of the cortex hanging to it. Figure 6 shows the defect immediately after operation and 6 and 11 weeks later. The single splinters are seen in the defect. The periosteal tube united the two stumps as a bridge. The ulna broke while putting on the plaster-of-Paris bandage. Six weeks after operation the fracture of the ulna had united by means of a massive callus. The radial fragments which were separated about 0.5 centimenter were united only on the ulnar side by means of a united callous mass, which at the central fragment is united with the callous mass of the ulna. On the outer side of the radial fragments, there are massive deposits of callus which do not unite but leave a space about 2 millimeters wide. Eleven weeks after operation we found a thick, continuous shadow in the region of the ulnar fracture and between the radial fragments. The radial fragments were embedded in the callus and were definitely recognized as such. They stood about 0.5 centimeter apart and this defect was filled with a callous mass. At the edge of the distal defect, there was in the radial callus, a small separation extending to the compact bone. Histological examination of the preparation showed that the defect of the radius was filled by a periosteal callus arising from the periosteum of the radius.

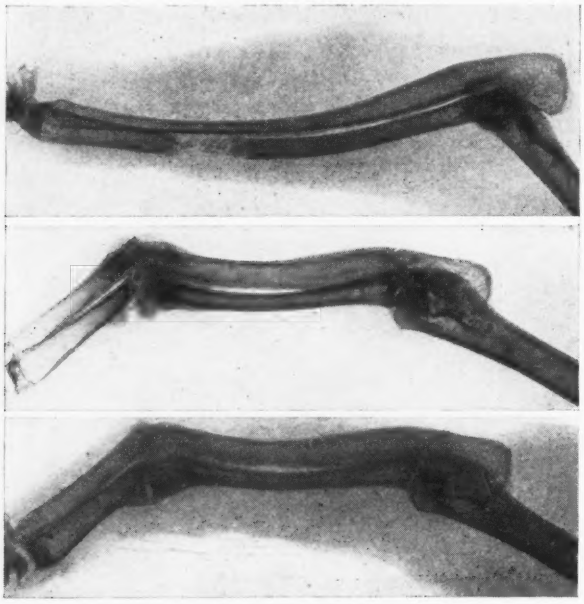


Fig. 6.—Circular compact bone defect with destruction of nutrient artery and curettement of marrow canals in the radius of an old rabbit. These roentgenograms were taken immediately after the operation and 6 and 11 weeks later.

In this place we would mention that the same conditions are of importance in the free transplantation of periosteum. If the periosteum in old animals is transplanted, only the adventitia is used as has been previously explained, and as the adventitia lacks osteoblasts, it does not regenerate bone. Of this we have been able to convince ourselves many times in transplanting the periosteum in old individuals (that is, adventitia alone). When the periosteum in young animals is transplanted and the proper technique is used bone is always present, as the cambium cells remain hanging on the periosteum. An example showing the bone-building power of the periosteum in old animals when the above mentioned conditions are present follows:

In a man of 60 years, the opportunity was presented during an operative reduction of a 20-day-old fracture of removing a small piece of thickened periosteum from the fracture end where it was possible to remove it easily from compact bone. This piece of periosteum

was transplanted subcutaneously and 14 days later removed. It was completely healed in and united with the surrounding tissue and had macroscopically built bone. In microscopic preparation (Fig. 7) one can see everywhere in the periosteum, which is rich in cells, marked osteoid and bone formation which extends into the hyperæmic surrounding tissue rich in cells. The periosteum and its cells are united with the subcutaneous tissue of its bed by means of a granulation tissue. Here we have good bone reproduction with an autogenous piece of periosteum (with the cambium layer retained) in the subcutaneous fatty tissue in an old man.

A further proof is found when a nose is made by transplanting an autogenous, periosteal covered piece of bone from the tibia. The bone is first transplanted free into the subcutaneous tissue of the arm. In such cases, according to Lexer, the bone when transplanted free in the soft parts, quickly begins

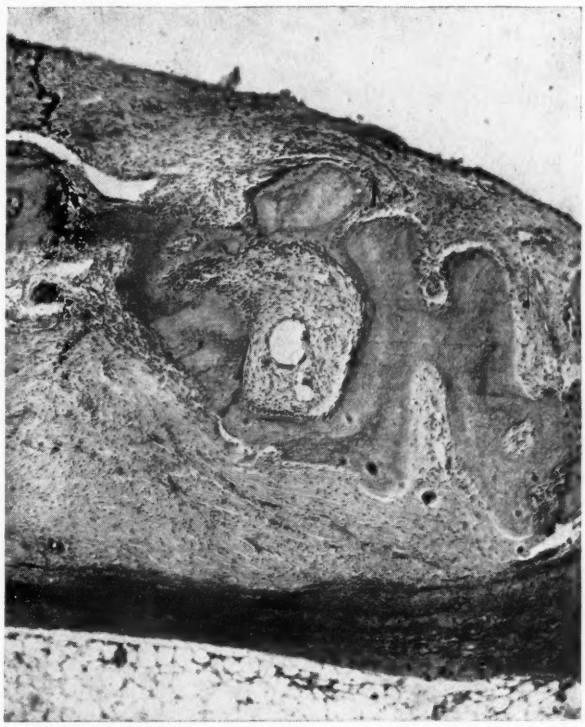


Fig. 7.—Free autogenous transplant of thickened living periosteum from a 20-day fracture in man of 60 years. This section was made 14 days after the piece of periosteum had been transplanted into subcutaneous fatty tissue. Marked bone formation from the periosteum is evident.

active building and destruction and everywhere the osteoblasts of the periosteum and also the endosteum form new bone.

Figure 8 is from such a case of nose plastic. A section of a small piece of bone was taken from the healed-in bone 4 weeks after the implantation in the upper arm. The processes mentioned above can be recognized readily. Especially noticeable is the definite covering of the bone on its periosteal side with a layer of intensely colored, typical osteoblasts and, in addition, in the marrow spaces are areas of erosion caused by giant cells which lie scattered in the deep bone.

To secure bone production by means of the periosteum it is necessary to maintain the natural union of both layers of the bone and also to retain its osteoblastic layer. According to Lexer the adventitia plays a secondary rôle;

it offers the osteoblast nourishment and protection; stimulus for bone formation does not come from it.

We were successful in all experiments in young and old animals, when we followed the conditions laid down in the beginning, and we obtained from the periosteal tubes functionally normal regeneration which approached anatomically very near the normal. In these cases the inner architectural structure of the new bone assumed early the static relationship (compact bone with the lamella in the outer layer running longitudinally, the spongy bone with irregularly arranged lamella and marrow spaces, see Fig. 2). In the regeneration of bone from a periosteal tube, the endosteum expends its energy in

Fig. 8.—Free autogenous transplant of living compact bone and periosteum from the tibia into the subcutaneous tissue, in a nose building operation in a man of 25 years. Four weeks after operation there is marked building and destruction of bone. *O.*, Osteoblasts; *P.*, periosteal osteoblasts.

forming a new marrow canal in the periosteal callous mass, and it is through the activity of the osteoblasts and osteoclasts that the new marrow canal is made (compare Fig. 2).

We were also able to determine that from partly retained periosteum there is sufficient bone regeneration to be of functional use.

A young rabbit was operated upon with the usual technique, and a cylinder of compact bone and marrow canal was removed. At the same time a half circle of the periosteum was removed and the marrow canals of the stumps were curetted. Figure 9 shows the defect (immediately after and three months after operation). Three months after operation, both stumps were united by a uniform bone shadow which on the outer side showed a concavity. Radius and ulna were united by means of a bridge-like callus. Histological examination showed a filling in of the defect by means of well formed bone from the

retained periosteum. The outer layer is of a compact structure, the inner layer is spongy. In this case histologically there is also a new formation of periosteum where the periosteum was operatively removed.

In our experiments we were able to substantiate the powerful regenerative action of the periosteum. Periosteal defects regenerate in the shortest time either from the cut edges of the remaining periosteum or from the islets of remaining periosteum, and finally from the endosteum of the haversian canals lying superficially in the cortex, provided the place of periosteal regeneration is not closed up by the early proliferation of the surrounding unspecific connective tissue. From such periosteal regeneration, bone defects in which the periosteum has been operatively removed and in which the remaining bony tissue has been removed (as numerous experiments show), can be united in a very satisfactory anatomical and functional way (experiments with endosteal cylinders, see below). The periosteum has such an ability to regenerate and build bone that its thorough destruction would be necessary to prevent bone formation. In all the experiments in which the periosteum was removed but the remaining bony structures were kept intact, and in which there was a total loss of periosteum, compact bone, marrow and endosteum,

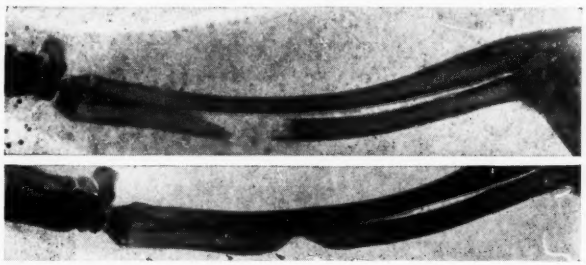


Fig. 9.—Circular compact bone and marrow and endosteum defect in radius of young rabbit. Nutrient artery destroyed and marrow canal curetted. Roentgenograms taken immediately after operation and three months later.

the periosteum in a short time forced its way through in all directions. Only through the early overgrowth of nonspecific connective tissue or through the destruction of the blood supply was periosteal regeneration destroyed.

Because of the quick regenerative power of the periosteum even in periosteal defects, a great many mistakes are made in judging the results in experiments, especially in determining the bone building power of the endosteum and marrow cylinder after the periosteum and compact bone have been removed. In roentgenograms there are often seen in such experiments, even in the middle of the defect, shadows of bones; under certain conditions the whole defect may be bridged by such a shadow (compare Figures 15 and 16). One might regard this bone building as myelogeno-endosteal, but careful microscopic examination explains this and shows definitely the periosteal origin of the callus. Therefore we see how important the periosteal regeneration, coming from the periosteal edges, is in the healing of defects. (See Figs. 15 and 16.) An exact histological examination of the preparation is necessary before conclusions can be drawn; roentgenograms may lead to error.

The influence of an *early static stimulus* does not disturb periosteal bone regeneration. It has a stimulating influence only on the early architectural

structure of the regenerated bone (a sort of outer compact bone, and an inner spongy layer). On the other hand, the process of regeneration is delayed if further mechanical stimuli are present, such as the free use of the extremity (no plaster-of-Paris splint from the beginning) with voluntary and involuntary muscle functioning, and the result is a distortion, pressing, rubbing, and rotation of the fragments. The bone formation in the callous mass shows in its length the result of these untoward influences.

These relationships will be demonstrated by means of roentgen pictures of an experiment. In the usual manner, as previously explained, a subperiosteal resection of a piece

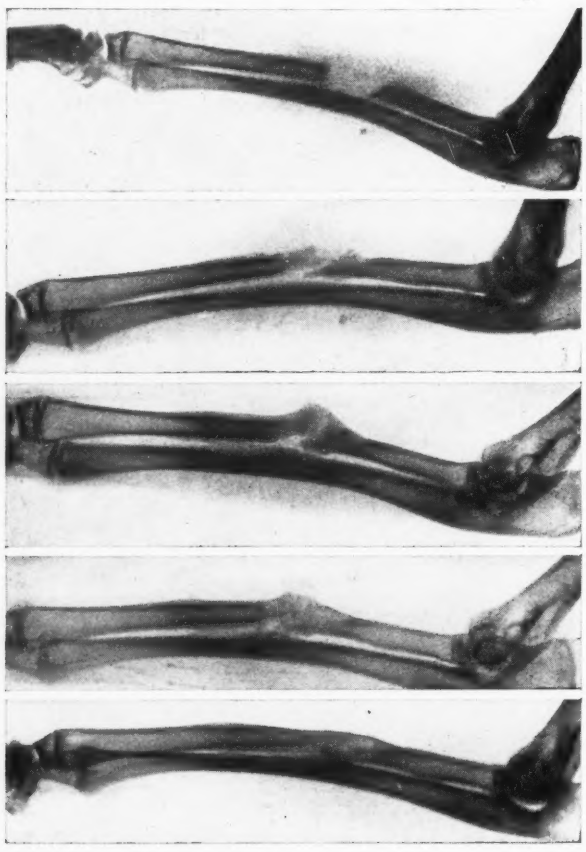


Fig. 10.—Circular compact bone and marrow and endosteum defect of radius in young rabbit. Roentgenograms taken immediately after operation and 11 days, 3 weeks, 4 weeks, and 83 days later.

of radius was done. In Figure 10 the defect is seen immediately after operation, 11 days, 3 and 4 weeks, and 83 days after operation. Eleven days after operation exuberant callus is seen at both ends of the stump in the vicinity of the proximal fragment, which shows a separation going through the callus. After 3 weeks, the callus is thicker and stronger. At the proximal fragment the callus has spread itself out plate-like and at the distal fragment it has the form of a joint head. Between the fragments is a wide space. After 4 weeks the roentgenogram still shows the separation, but the space is much smaller. Finally after 83 days, the roentgenogram shows the two fragments united by means of a continuous callus, which on the outer side of the proximal fragment seems to be loosely built. Histological examination shows the defect to be filled by a large periosteal callus which, however, does not as yet show such advanced architecture as was shown in another experiment

which was observed the same length of time. The whole callus is more spongy, and shows instead of early fissure formation early callous formation in the form of embryonic tissue and islets of cartilage.

Lexer's principle, "incomplete fixation in the first weeks, until the hyperæmia of the fracture has subsided" is fully substantiated in these animal experiments.

2. THE RÔLE OF THE MARROW AND ENDOSTEUM IN BONE REGENERATION

During our experiments the overwhelming importance of the periosteum in bone regeneration was shown, and from this we can infer that the rôle of marrow and endosteum in bone regeneration is much smaller. We could show that bone is built by the marrow and endosteum in so much as the nourishing blood vessels (the nutrient artery and its intraosseous anastomoses) are intact. With these intact bone formation begins in the marrow spaces and grows into the defect. There develops in the experiment (retained cylinder of marrow and endosteum with an absence of periosteum and compact bone), from both marrow canals more or less bone regeneration growing out mushroom-like which is not able to unite itself. Between the two there remains in the middle of the defect a space filled with a connective tissue of the degenerated marrow and endosteum, and connective tissue from the immediate surrounding; *thus a pseudo-arthrosis constantly results.*

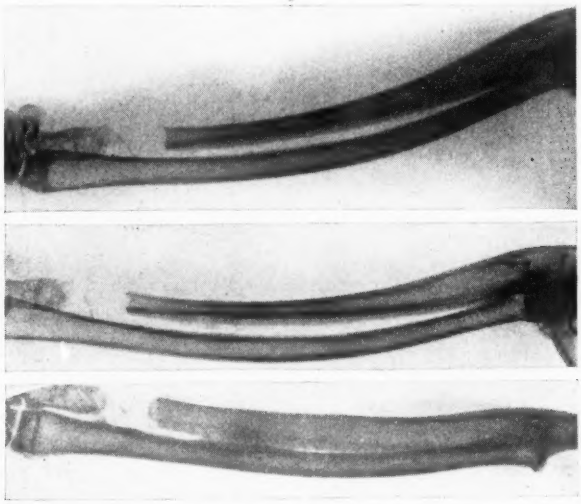


Fig. 11.—Circular compact bone and periosteum defect of ulna in young rabbit. Periosteum scraped off 1.5 centimeters on stumps. Roentgenograms taken immediately after operation and 12 and 32 days later.

Figure 11 shows the regenerative processes in a young rabbit in which a periosteal and cortical defect was made in the right ulna and the marrow and endosteum and its nutrient artery retained. The periosteum was scraped from the stumps for a distance of 1.5 centimeters. A plaster-of-Paris bandage was applied. Immediately after operation we see two fine line-like bone splinters; 12 days after operation we see light cloudy layers on the inner sides of the ulnar fragments of the radius. The stump ends and the defect show no callus. After 32 days the roentgenogram shows the light shadow of the stumps and, on the ends like a mushroom, peripherally and centrally, a 2 centimeter long irregular, callus shadow. The defect is not bridged by the callus mass. There is a bridge-like callus between the central ulnar fragment and the radius and a small exostosis on the radius

opposite the peripheral ulnar fragment. From the histological picture, Figure 12, one can see how extensive myelogeno-endosteal bone building has taken place at the end of both marrow canals, has grown out a short distance and, for the most part, closed the canals. Toward the defect the border of osteoid cells of this callus blend into a compartment-like connective tissue, rich in cells, reaching out in all directions, which as yet has not formed the precallous stage. The blood supply of this connective-tissue-like marrow

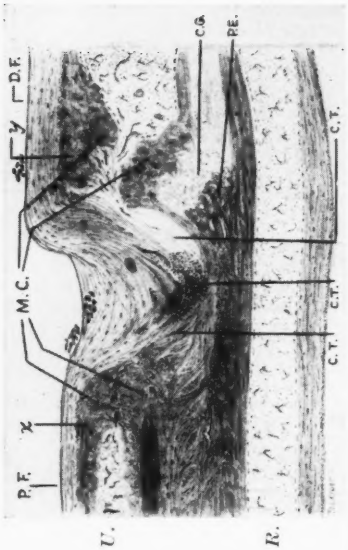


Fig. 12.—Drawing of section of bone from same experiment as shown in Fig. 11. *P. F.*, Proximal fragment; *X, Y.*, site of operation; *M. C.*, myelogeno-endosteal callus; *D. F.*, distal fragment; *C, C.*, cartilaginous callus between marrow callus of ulna; *P. E.*, periosteal exostosis of the radius; *C. T.*, connective tissue of defect and surrounding tissue; *U.*, ulna; *R.*, radius.

Fig. 13.—Circular compact bone and periosteum defect of ulna in young dog. Periosteum scraped off 2 centimeters on stumps. Roentgenograms taken immediately after operation and 3 and 10 weeks later.

and endosteum part becomes more sparse outside of the callous ridge. Taking part in the forming of connective tissue of the defect is the unspecific connective tissue of the surrounding parts with innumerable cells and blood vessels. Opposite the peripheral fragment and its myelogeno-endosteal callus, is a periosteal callous mass of the radius and, by means of cartilage, this is united with the ulnar fragment (mechanical influence of movement). Some distance from the stump end, the periosteum has regenerated and formed a callus.

Similar but much farther advanced processes are found in experiments which were followed for a longer time in a young, large dog, in which in the usual manner, a 2.5-

centimeter piece of periosteum and compact bone was taken from the right ulna with the marrow and endosteum intact. The periosteum was removed from the fragment and the nutrient artery saved; plaster-of-Paris dressing was applied and worn for 4 weeks. Figure 13 shows the defect immediately after the operation, and 3 and 10 weeks after operation. A cloudy shadow, about 7 millimeters long, is seen on both of the fragments 3 weeks after operation. After 10 weeks, the roentgenogram shows the shadow more compact and somewhat larger. The defect not yet filled by callous mass, is about 8 millimeters in length. The histological preparation (Fig. 14), shows both marrow canals completely closed by the myelogeno-endosteal, spongy, callous mass. These callous masses quite markedly overreach the edges of the defect on both sides; however, they do not touch one another, but between them is a space of about 8 millimeters which is filled with connective tissue. This connective tissue of the defect arises partly from the endosteum and partly from the surrounding connective tissue. The outer surfaces of the bone stumps have no periosteum and are covered by the immediate surrounding connective tissue. At a distance from the place of operation, the periosteum has regenerated on the bone ends, just as in the cases mentioned before.

While from the marrow and endosteum cylinders only an incomplete filling of the defect with bone took place, we could show in our experiments that

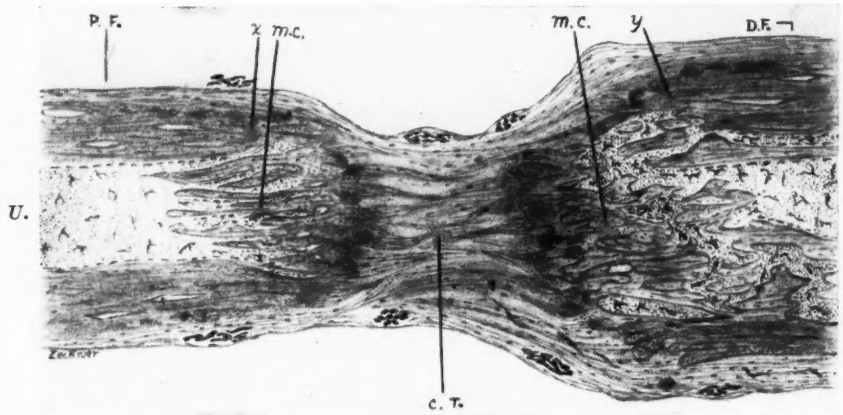


Fig. 14.—Drawing of section of bone from same experiment as shown in Fig 12. *P. F.*, Proximal fragment; *X. Y.*, site of operation; *M. C.*, myelogeno-endosteal callus; *D. F.*, distal fragment; *C. T.*, connective tissue of defect (marrow and endosteum and connective tissue of vicinity); *U.*, ulna.

from the periosteal rests a marked bone regeneration may take place, and under certain conditions, may lead to bony union of the stumps. Periosteal regeneration occurs especially in experiments in which the periosteum has not been thoroughly scraped from the ends of the stumps. To demonstrate this, we have a series of experiments, one of which will be described below (Figs. 15 and 16). In the two cases illustrative of marrow and endosteum cylinder, the periosteum was removed for some distance from the stump ends in order to exclude the periosteal regeneration; but in spite of this the periosteum regenerated partly, even though it did not reach the field of operation. We wish to point out that such periosteal regeneration must be sharply differentiated from the myelogeno-endosteal regeneration.

The bone building processes from the marrow and endosteum add bone to the compact bone at the end of the marrow canal. Here the stiff walls of bone protect the extremely delicate marrow and endosteum from mechanical influences and, at the same time, exclude the damaging influence of such stimuli upon hyperæmia and callous formation. Since the bone formation sets in

just at the end of the marrow canal, the nutrient arteries at this place are gradually compressed and are soon shut off. For this reason the blood supply to the marrow and endosteum, lying outside of the marrow canal, is decreased, even before bone building can begin. The supply of nourishment is completely cut off as soon as the marrow canal is completely closed by the callous mass. A result of these processes is the forming of pre-callous masses from the marrow and endosteum which set in later near the middle of the defect. In the middle of the defect, for reasons previously stated, the decreased blood supply makes itself evident even before further development of the callous masses takes place.

Now we know that the delicate callous masses are hindered in forming bone when nourishment is interfered with through mechanical stimuli. Such mechanical stimuli are not entirely prevented, due to the nature of the experiments, even when plaster-of-Paris bandages are applied. Even the continuous pressure of the surrounding soft parts and muscles as well as the slight movement (impossible to prevent) of the fragments, causing laceration and rubbing of the cylinder of marrow and endosteum and its blood vessels, is sufficient in this extraordinarily sensitive cylinder of endosteum and marrow to cause tearing of the nutrient blood vessels, hæmorrhages, necrosis, or even tearing and breaking off of the cylinder of endosteum and marrow. If the cylinder of endosteum and marrow is not damaged from the beginning by these things and callous masses form in the defect, the callous masses will degenerate into connective-tissue degeneration products as a result of poor nourishment due to the diminution of the blood supply caused by the unpreventable mechanical stimuli. The marrow callus, as a result of its early development inside the marrow canal, protecting its regenerative processes from mechanical influences, digs its own grave; the callus walls up the marrow canal too early.

Therefore much myelogeno-endosteal bone formation occurs at these places where the nourishment from the nutrient arteries remains undisturbed, and the hyperæmia, as a result of this, can work sufficiently long. If the hyperæmia is shut off too early, or is not present at all, every trace of bone regeneration is absent in these places. With Lexer we believe that the reason for this lies only in the damaging mechanical influences on the poorly nourished callous masses, as we know that where free pieces of marrow canal tissue are transplanted, the bone building parts are nourished through ingrowing embryonic tissue of the host and that they form pieces of bone, which, in the course of time, as a result of lack of function, are again absorbed. Between the periosteum and endosteum with reference to their bone regenerating power, there is fundamentally no difference. The early disturbance of the bone regenerative power of the marrow and endosteum takes place, first, because the sensitive marrow and endosteum is easily damaged; second, being easily damaged, mechanical stimuli do so much more damage; third, the interference with the blood supply since the blood supply runs through the middle of the marrow and endosteum cylinder. The periosteum on the other hand has the bone formed on its inner side, the adventitia and the blood vessels entering

from the outside; as a result of this, the bone building processes are not disturbed.

But the mechanical stimuli cannot be excluded from working on the most easily damaged part of the defect—the middle—even if a plaster-of-Paris bandage is applied. As a result there are hæmorrhages, necroses, or even a breaking of the continuity of the marrow and endosteum cylinder. In these damaged places granulation tissue from the surrounding unspecific connective tissue replaces the damaged tissue, and indeed, this happens early before the specific marrow and endosteal regeneration can set in at the stump ends after the development of the hyperæmia of the fracture. Furthermore, the granulating tissue of the immediate vicinity, growing into areas not traumatically damaged, carries unspecific connective-tissue elements with the precallous states of the marrow endosteum cylinder and so helps to promote their change into connective tissue. In one way or another there appears in the defect, especially at greater distances from the edges, areas of callous formation poorly nourished, or areas of unspecific connective tissue of the immediate vicinity, which on account of the continual actions of mechanical stimuli, lead to complete replacement by connective tissue and therefore to a pseudo-arthrosis.

Where the blood vessel supply is intact the condition necessary for bone regeneration in a marrow endosteum cylinder is unfavorable. The conditions become especially bad when the nutrient artery is destroyed. The hyperæmia in such cases cannot develop at the proper time, but develops only when the collateral circulation in the marrow endosteum cylinder has developed. According to the investigations of Lexer, these processes take about 4 to 5 weeks. In this time the marrow canal in the defect is closed, either by the periosteal regeneration and bone formation, if the periosteum has not been thoroughly removed, or from the connective tissue of this region. For these reasons the delayed callus of the marrow and endosteum cannot develop. Increasing the time of fixation is not necessary inasmuch as a bridging of the defect takes place from the periosteum. The myelogeno-endosteal bone formation results in such cases only inside of the marrow canal. In comparison with the cases in which the nutrient vessel is intact, the myelogeno-endosteal bone regeneration is very little.

As an example of these conditions we will show the pictures of a young rabbit in which a cylinder of compact bone and periosteum retaining the marrow and endosteum, was removed from the ulna and the nutrient artery destroyed. The periosteum was scraped from the ends of the stump 0.5 centimeter in length. The wound was sutured and a plaster-of-Paris bandage put on and worn for 4 weeks. Figure 15 shows the condition immediately after operation, 15 days later, and 6 and 10 weeks after operation. After 15 days there were shadowy deposits on the outer surfaces of the compact bone, but not on the incised area of the marrow canal. On the inner side of the radius there is a bowlike, roughened, callous mass. After 6 weeks the shadowy layers on the outer side of the compact bone of the radius and ulna are united. After 10 weeks the defect is more completely filled out with callus, except on the outer side of the ulna where there is still a small place not filled out. From the histological picture (Fig. 16) one can recognize by comparing with earlier cases (Figs. 12 and 14) the extraordinarily slight myelogeno-endosteal callous formation at the ends of the marrow canals, which are slightly covered by the callous formation, and toward the defect are beginning to be closed off. In a very definite

way one can see the great vicarious periosteal regeneration and callous formation which has filled the whole defect. The inner structure of the periosteal callus is already far advanced (compact-like structure on the outside, spongy structure inside). At the same time one can see, that at the peripheral fragment and in the defect, the periosteal blood vessels which are forcing their way through the callous mass, are taking part in the vascularization of the marrow canal.

In a series of experiments with intact marrow and endosteal cylinders in which the nutrient artery was destroyed, the unspecific connective tissue of the surrounding structure grew more or less into the marrow canal. In such cases bone formation may take place as a result of the delayed regeneration of

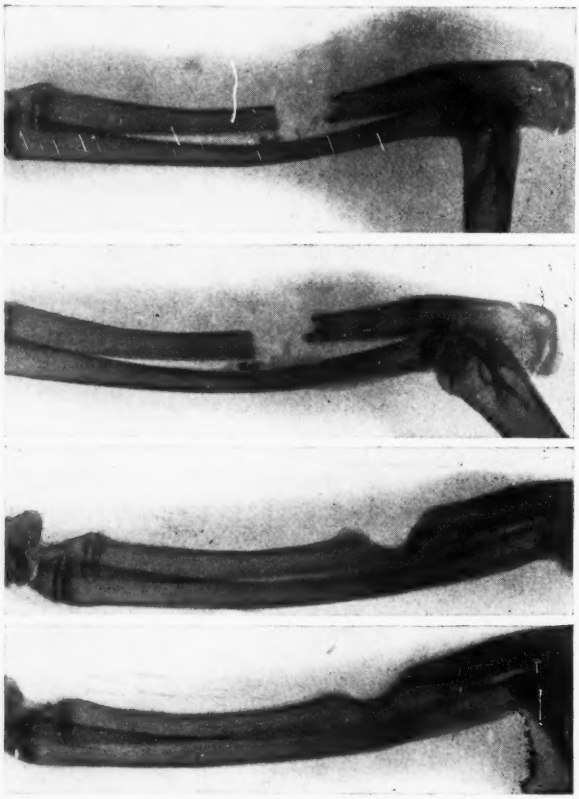


Fig. 15.—Circular periosteum and compact bone defect of ulna in a young rabbit. Periosteum scraped off stump ends 0.5 centimeter. Roentgenograms taken immediately after operation and 15 days and 6 and 10 weeks later.

the marrow and endosteum, where the infiltrating connective tissue stops, that is more or less deep in the marrow canal.

The process of bone regeneration is slower in older animals than in younger animals. Unlimited mechanical stimulation which results from a free use of the limb (no plaster-of-Paris splint) from the beginning damages quite markedly the sensitive marrow and endosteum and as a result much less callus is formed than in animals in which this damaging mechanical stimulus is reduced as much as possible by means of plaster-of-Paris bandages. Furthermore, the free use of the extremities in the first weeks (no plaster-of-Paris splint) has a delaying influence upon the bone formation in the early callous tissue.

3. THE RÔLE OF COMPACT BONE IN BONE REGENERATION

From our experiments we can conclude that compact bone, inasmuch as it is robbed of its periosteum and marrow and endosteum, and by this of its nourishing blood vessels, is attacked by the infiltrating connective tissue from the immediate vicinity and becomes porous. If nourishment is not very quickly supplied from the neighboring periosteum or marrow and endosteum, spon-

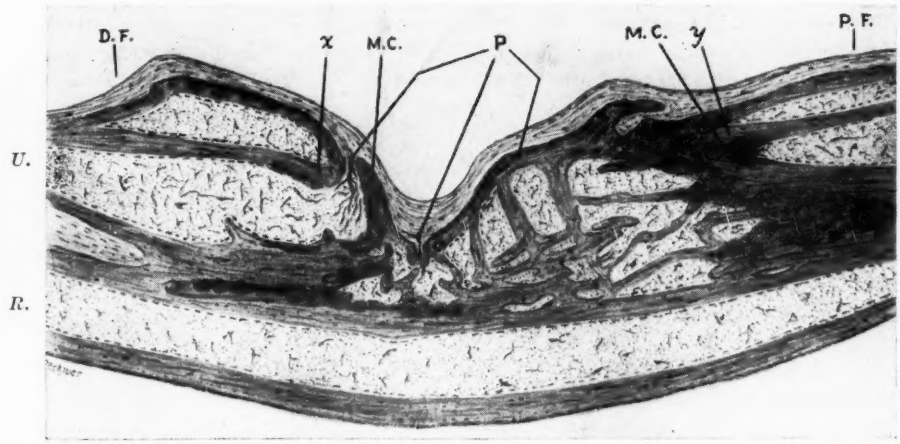


Fig. 16.—Drawing of section of bone in same experiment as that shown in Fig. 15. *D. F.*, Distal fragment; *X. Y.*, site of operation; *M. C.*, myelogeno-endosteal callus; *P.*, regenerated periosteum with callus and periosteal blood vessels; *P. F.*, proximal fragment; *U.*, ulna; *R.*, radius.

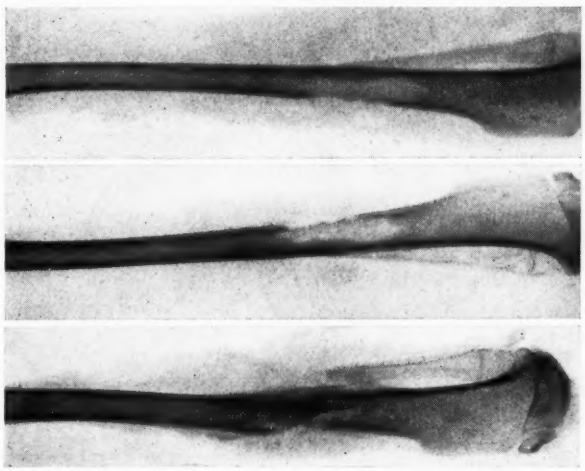


Fig. 17.—Periosteal covering and marrow and endosteum defect of tibia in young rabbit. Fracture of fibula opposite intact shell of tibia. Roentgenograms taken immediately after operation and 7 and 16 days later.

taneous fracture will result in such pieces of compact bone, especially under the influence of function and weight bearing. The *cortex denuded of periosteum and marrow and endosteum does not take part in bone formation.* On the other hand, we could prove that as the denuded compact bone was again nourished, periosteal regeneration and bone formation took place from the osteoblasts of the haversian canals.

As proof of these statements we wish to present the roentgenograms of a case in which the periosteal covering of the tibia was entirely removed. From this piece, free from periosteum, the front wall of bone together with the marrow and endosteum was removed. In this case, for a distance of about 2 centimeters there was only the posterior shell of compact bone free of periosteum, marrow, and endosteum. It remained undamaged while the fibula was bent in. The wound was sutured and no plaster-of-Paris bandage applied. Figure 17 shows the condition immediately after the operation, the defect of the anterior tibial wall and, opposite the shell of compact bone of the tibia, a horizontal fracture line in the fibula without dislocation. The posterior shell of compact bone of the tibia is not fractured. After 7 days (Fig. 17) small callous masses can be seen on the outer surface of the lower edge of the compact bone; the posterior shell of the compact bone shows nothing of especial interest. After 16 days (Fig. 17), one can recognize the callous formation on the tibial fragments spontaneously fractured. Between fibula and tibia there is a callous bridge. Histological examination showed the atrophic and degenerated posterior shell of the cortex and callous formation only when periosteum, marrow, and endosteum were retained; therefore only to the base of the shell of the compact bone.

As a further example, we wish to show the roentgen pictures of a case where a 2.5 centimeter piece (periosteum, compact bone, marrow, and endosteum) was sawed out of the radius and, at the same time, the nutrient arteries were destroyed and the periosteum on both stumps removed to the joint ends (total defect). The wound was sutured, and a plaster-of-Paris bandage applied and worn for 4 weeks.

Figure 18 shows the defect immediately after the operation and 4 weeks and 19 weeks later. After 4 weeks the stump ends show a washed out lighter shadow and no callus. After 19 weeks the stump ends are irregular points and show a high grade atrophy, but no callous formation. Microscopic examination showed a defect filled with connective tissue and an atrophic cortex which was surrounded by unspecific connective tissue from the neighborhood. At isolated places one could see small periosteal islands, which had developed on the outer surface of the bone growing out from the haversian canals beneath the connective tissue.

(*To be continued.*)

INTELLIGENT CO-OPERATION BETWEEN THE GENERAL PRACTITIONER OF DENTISTRY AND THE ORTHODONTIST IN THE PREVENTION OF IRREGULARITIES OF TEETH*

By Dr. P. T. Meaney

IF YOU analyzed the ages of human development you would find that it could be appropriately divided into three periods; the first, when man subsisted by the use of those things he found in nature, as a cave dwelling, wild fruit, fish and flesh for food, and a stick or stone for a weapon of offence or defence.

In the second, he fashioned himself a dwelling, constructing it from tree branches and skins; this protection he could set up in a place best suited to the food and water supply. He lashed the stone to a stick and made a more effective weapon; he cultivated the fruit, improving its quality and increasing its quantity. He herded and domesticated the food animal, controlling his supply. He studied the laws of the universe, and he made new combinations that had never existed before in the world.

In dentistry there was a long period in which the efforts were for the relief of pain. The second period was for the repair of damages and for the restoration of loss, and, finally, the period of prevention is just begnning. Operations on individual teeth are not made for restorations only but for the prevention of the cause of the loss.

We are well on our way to a period in which dental diseases and their systemic consequences may be controlled. The dental practitioner holds in his relation to the family practice a very important link in the prevention of many diseases and their sequelæ, e.g. irregularities of the bones and teeth.

Malocclusion is always a perversion of the normal denture. The rapid development of this specialty of orthodontia has been due to a study of the denture, and not the invention of appliances. Prevention of malocclusion and other mal-developments of the bones and soft tissues of the face, can only be accomplished by anticipating the causes of the perversion and preventing their results. The human denture is a unit in the same sense as our automobile is a unit. The driving power of the automobile is made up of wheels, each wheel having its respective cogs. The human denture is made up of a number of teeth, and each tooth has a characteristic number of cusps. The efficiency of the human denture depends on the relation of the inclined planes, that is the structural element of the denture rather than the tooth.

The thought of our profession has ever been concentrated upon the tooth, rather than the denture as a mechanical unit or the cusp as the structural element. It is a significant fact that in the wear of proximal surfaces or the lack of a reproduction by restoration of the mesio-distal diameter of teeth, the distance around the arch may be reduced by several millimeters. When

*Paper read at the Congress of the European Orthodontological Society.

this happens there is a proportional wear of the inclined planes of the cusps. In order to prevent this wearing of the inclined planes an harmonious relation of diameters of all teeth would be necessary. The arch has not developed to accommodate teeth whose sizes were destined to be what they are in the early life of the child, some of them before the child was born. It is not logical to remove teeth to fit the arch, but rather to develop the arch to accommodate an harmonious relation of teeth.

The dental profession owes its existence in the past to the recognition by the world of the dentist's ability to eliminate pain, and his ability to improve the masticating apparatus. Today the people recognize that an individual with a perfect denture can give greater efficiency in his undertakings and enjoy the pursuits of happiness more thoroughly.

The development of the human denture requires the full period of physical growth and vigor to attain its completion, and is dependent upon full physical growth and vigor to attain its typical perfection. We cannot expect to find a perfect denture in a frame, every part of which has in development fallen short of its hereditary possibilities or pattern.

The human denture not only requires full physical growth for its development, but it is itself a development mechanism by which the functional forces are distributed, resulting in the development of other parts, especially the framework of the face and head. The manner in which the denture is used becomes a characteristic of the individual and results in determining not only the form of the arch but the shape of the face and head.

When we consider that a temporary denture must be replaced by a permanent one in which the individual teeth are larger and more powerful it behooves us to be more cautious and give more consideration to the deciduous teeth. The premature extraction or loss of structure of deciduous teeth will not only interfere with the eruption of the permanent teeth but also the growth of the bones of the head and face. It is due to the above fact that a very large percentage of malocclusions have their beginning in the period between the completion of the temporary denture and its replacement by the permanent ones.

Another very important link in the development of the denture is the first permanent molars. These four teeth will determine the relation of the mandible and maxilla during the replacement. The relation of these teeth to each other not only determines the relation of all the other teeth to each other, but determines the distribution of functional forces so as to mould the form of all of the face normally or abnormally. Loss of the first permanent molar causes more malocclusion than any other factor.

Living tissues are characterised by relation and, in order to have full development of the human denture, the living units of the tissues, the cells, must be of full vital vigor, they must be supplied with all the elements necessary for their metabolism in their food supply, and they must be stimulated to activity by the mechanical stresses brought to them by the full, vigorous functions in which the jaws and the teeth play a part.

Let us suppose the four first permanent molars were extracted at an early age; what will be the prognosis? First, the denture is robbed of four of the

most powerful teeth; the anterior teeth are not carried as far forward as they should be and remain in an abnormal relation to the rest of the skull, producing a peculiar concavity from nose to chin and under-development of the anterior part of the face. Supposing we remove one or both of the superior first molars and retain the lowers; what will be the prognosis? The superior anterior teeth will not move forward and the space is partially filled by the tipping distally of the bicuspid and the tipping of the second molar mesially. The result is a false prognathism, which in reality is a result of the under-development of the premaxilla and maxilla; and not an over-development of the mandible. Some of the most deforming malocclusions are produced in this way.

Let us remove one or both of the lower molars and retain the uppers, and what will be the prognosis? The lower anteriors are tipped distally by the pressure of the lip; the lower second and third molars are tipped mesially more or less closing the space for the lost teeth. The upper incisors are apparently protruding, and the upper arch is narrow in the bicuspid region. These cases are mouth breathers, for normal lip function becomes impossible.

What will the prognosis be if there is a premature loss of the deciduous teeth? For instance if the deciduous cuspid is decayed or lost there will be a narrowing of the anterior portion of the arch because of the loss of the cuspid relation, and we will find the laterals crowded lingually and the permanent cuspids high up either in a labial or lingual position.

The premature shifting mesially of all the first molars and bicuspids because of a loss of the temporary molars produces one of the most difficult malocclusions to correct, and one in which the most terrible failures have occurred. We should take into consideration habits, such as thumb sucking, lip habits and anything that might disturb the balance of developmental forces which also affect the direction of growth and finally destroy the relation of inclined planes. Any abnormal habit, either functional or nervous, therefore, becomes a cause of malocclusion and many of them are preventable, coming most naturally under the observation of the dentist first.

Mouth breathing is a very common perversion among children and it is a cause of malocclusion; malocclusion is also a cause of mouth breathing. Abnormal breathing function disturbs the balance of developmental forces, modifying the growth of bone until the teeth come to be in such abnormal relation to each other that normal lip function becomes impossible. It is exceedingly important to recognize these cases early and correct the abnormal functions before the relation of the inclined planes has been disturbed to such an extent that normal development cannot go on.

At present we are only beginning to get a little light on the relation of diet and internal secretions to calcium metabolism. I believe that the dentists often, as I have said above, have the first opportunity of detecting these disturbed functions, a symptom of which would be the early resorption of roots of temporary teeth, or the lack of resorption of the roots of these teeth. In this we find a grave perversion in metabolism, the correction of which may mean much in the entire history of the individual. Diet would be one of the means of correction.

In conclusion the preservation of the permanent molars, the retention of the perfection of the temporary denture through its entire period of function, the recognition and prevention of abnormal habits and the detection of abnormal metabolism through their dental manifestation, present a challenge to our profession which will call for all the vigor of all the men in it, to reduce the increasing number of malocclusions among all classes of citizens. If these conditions could be strongly enough impressed upon the dental profession, the dentists could do more for the good of humanity in the prevention of malocclusion than twice the number of orthodontists could accomplish in the correction of malocclusions when they become firmly established.

DISCUSSION

The President said it was a matter of much regret that Dr. Meaney was not present to answer whatever discussion might take place on his paper. In France it was not the custom to discuss papers when the authors were not present, but that custom did not hold with the European Orthodontological Society. The thing that had struck him most about the paper was the question of prevention. A great deal had been said so far about prevention, and he would like to call attention to a very interesting paper on the prevention and prophylaxis of malocclusion and maxillary deformities which had been given last January by George Wieland and Dr. Denevosy, read before the French Society of Orthodontics. He considered that paper a most valuable contribution to the literature of orthodontic science. He would not, of course, attempt to give a synopsis of that paper, but there was one thing which the authors mentioned in it and which he desired to bring out. The authors said that there were three periods in a child's life, and that therefore three periods in this prophylactic work could be considered. The first period went up to 2 years; the second period went up to 6 years, during the time in which the child had all its temporary teeth; and the third period was from 6 to 12—that was, the casting off of the temporary teeth and the cutting of the permanent. According as one considered those different periods the prophylactic action would be different. If one took the child in its youngest period until the age of 2, when all its teeth were cut—its first teeth—the dentist had nothing to do with it. He did not see the child; he never had it in his chair. The persons who had the most connection with the child were the family doctor and nurse obstetrician. Those were the people who, by directing mother, could influence her and get her to give the child proper diet and so on, so that the child would develop normally and have normal jaws for its age when it came to be 2 years old. Mostly until the age of 6 the child was in the hands of its parents. Therefore from the age of 2 until the age of 6 the parents would be the ones who would have the care of the child mostly and whose prophylactic teaching would be the greatest. From the age of 6 the dentist would have occasional connection with the child for decay, and so on, but his connection would still be very slight. From the age of 6 until the age of 12 the child was losing its temporary teeth and cutting its permanent teeth. During that period the physician probably had very little to do with the child. Its parents, of course, still had the upper hand, but it was the dentist who would direct the parents during those ages and tell them what to do and what not to do. Therefore as one passed along the child's history, one saw that in the first period the physician was the man who must direct the prophylaxis; in the second period it was the child's parents, and in the third period it was the dentist. But who knew about that? Nobody. It was the business of orthodontists to teach them; they must teach the dentists; they must teach the physicians and they must teach the parents what must be done for prophylaxis.

Dr. Lockett said there were quite a number of things which could be stated about the paper in compliment to the author. There were, however, a good many controversial points in it. No doubt the author could find apparent proof for many of the statements made in the paper, but, on the other hand, he (Dr. Lockett) could do the same thing with

regard to many points on which he might disagree with Dr. Meaney. He could mention many instances which would disprove some of the statements made.

The President said Dr. Lockett's remarks showed how difficult it was to discuss a paper in the author's absence, and gave the reason why such a procedure was not adopted in France—namely, that it did not give the author a fair chance to defend his point of view.

All the members could do was to ask Dr. Lockett to extend the thanks of the Society to Dr. Meaney, and to express the hope that at some future meeting Dr. Meaney would appear in person to read a paper.

AN APPLIANCE FOR MOVING CANINES*

By J. M. Jones, D.D.S., Wichita, Kansas

THIS appliance is designed for one purpose only; the bodily movement of a canine or canines distally. The lingual base wire is for anchorage and can be so made as to pit all the teeth of the maxillary arch against the canine or canines.

The canines slide distally on the buccal wire without rotating or tipping. The force is supplied by a rubber band or silk ligature.

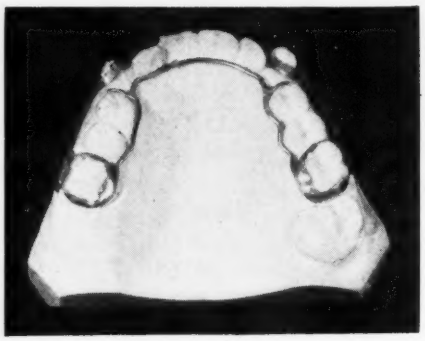


Fig. 1.

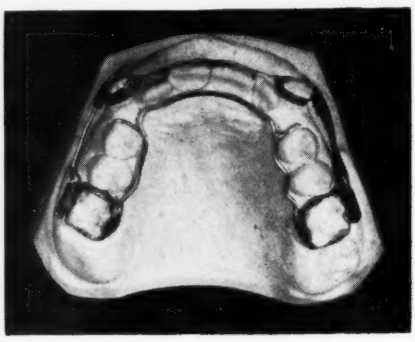


Fig. 2.

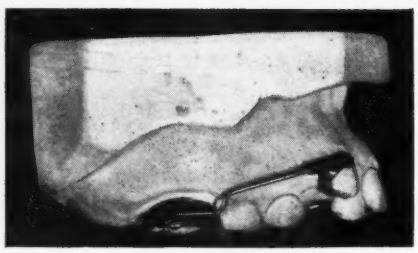


Fig. 3.

*Clinic given before the Twenty-fifth Annual Meeting of the American Society of Orthodontists held at Atlanta, Ga., April 14-17, 1925.

A PHOTOSTATIC-GNATHOSTATIC COMBINATION*

By O. W. Brandhorst, D.D.S., St. Louis

LAST year, at our meeting in Kansas City, Mo., many of you will recall that Dr. Paul Simon of Berlin presented a method of taking impressions which enabled us to ascertain the relative position of the teeth to the rest of the skull. The instrument he used for recording this he called a gnathostat, a full description of which, with details of application, may be had by referring to the International Journal of Orthodontia, December, 1924. The landmarks he used in his work were the eye-points (orbitalia) and ear-points (tragi), the line connecting these points being the horizontal Frankfort line.

You will remember also that he used a second apparatus which he called the photostat. The purpose of this was to secure a picture with eye- and ear-

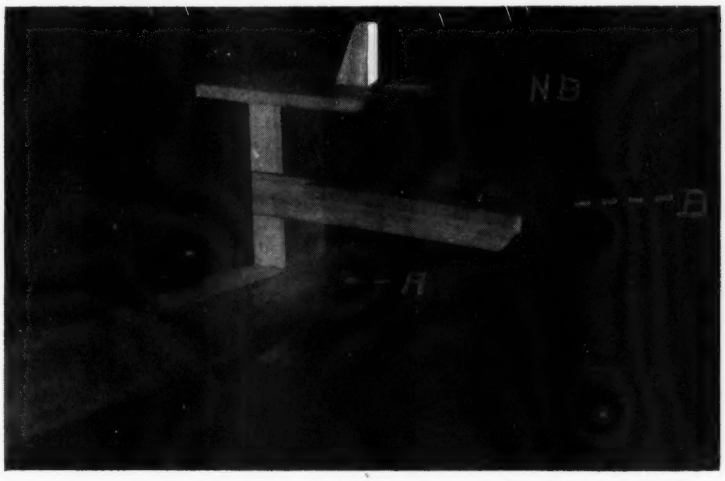


Fig. 1.

points and angle of the jaw marked with black court-plaster and to know that the picture was exactly the desired size. The possibilities of this were numerous, but among these one finds it possible to combine photographs or negatives of face and casts in a way, heretofore impossible, that may mean a short cut to the former method of combining facial cast and dental insert.

Having taken a photostatic photo and finished a gnathostatic cast, we proceed to take a photo of the cast, taking the same side of the cast as of the face. Previous to photographing the cast, a line should be drawn perpendicular to the base of the upper half of the cast and also at right angles to the median line, passing through the mark recorded on the impression, representing the line connecting the two eye-points. With this line established, the photograph of the cast is made. The photograph of the face and cast must be in the same proportions, that is, both one-fourth, one-half, or full size.

To facilitate this, an attachment has been made for the nose-board carrier of photostatic outfit, which is readily inserted when photographing the cast. By placing the cast on this extension, in the proper relations to the nose-board,

*Clinic given before the Twenty-fifth Annual Meeting of the American Society of Orthodontists held at Atlanta, Ga., April 14-17, 1925.

one is always assured of the correct distance of the cast from the lens, the position of the cast being identical with that of the patient.

Fig. 1 shows this attachment, *NB* designating the nose-board; *A*, the arm carrying the nose-board and attaching it to camera and stand; *B*, the attachment or extension for the cast.

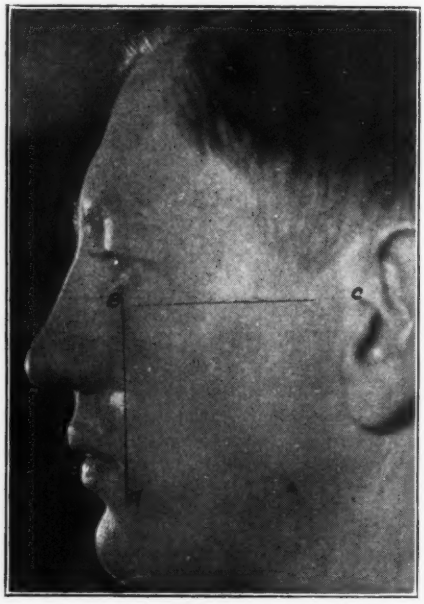


Fig. 2.

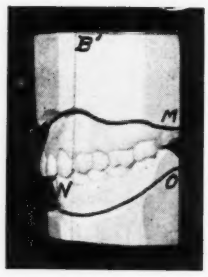


Fig. 3.

Fig. 4.

With the negative of both cast and face finished, we are ready to begin the marking for our purpose.

On the facial negative we draw the line *BC* (Fig. 2). This is the horizontal Frankfort line and connects the eye-point and ear-point. Then we draw the orbital line *AB*, this being a perpendicular to *BC* from point *B*.

On the negative of the cast (Fig. 3) we find reproduced a line, *A'B'*. This is the line that corresponds with the orbital line as described previously. We recall that the base of the upper half of the cast represents the horizontal Frankfort line and forms a right angle with the orbital line. We therefore draw the line *B'C'* perpendicular to *A'B'* through *B'*. The perspective in photographing, due to angles, makes it necessary to draw this line instead of depending upon the base for our line.

We then find that we have a point common to both the facial negative and the cast negative and lines that fall in the same planes. If we superimpose the facial negative upon the negative of the cast, so that point *B* falls on point *B'*, and line *AB* along line *A'B'*, we also find line *BC* falling along line *B'C'*. (Figs. 2 and 3). Holding these negatives in position, we make a photographic

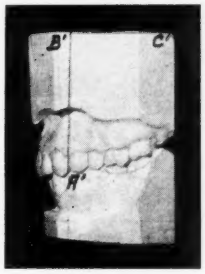


Fig. 5.

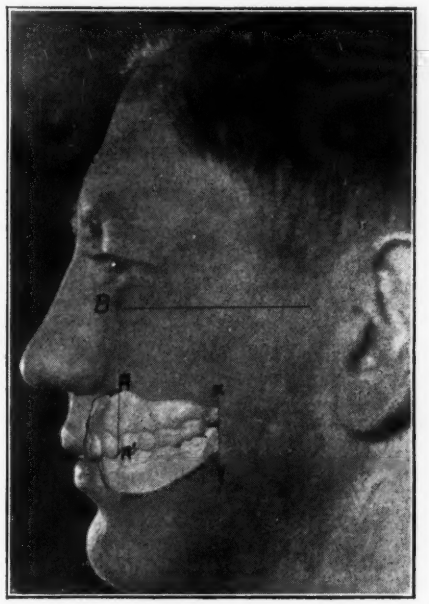


Fig. 6.

print of both negatives simultaneously, and the position of the cast is reproduced in its relation to the facial lines. (Fig. 4.)

If we wish to go further and eliminate much of the base of the cast from the combination, the procedure would be as follows: Make a print of the marked negative of face and cast separately. Cut print of the cast along line *N N O* (Fig. 5) being careful not to cut from *M* to *O* or *O* to *M*. On the facial print, make a cut *XY*, parallel to line *AB*, long enough to permit the passage of the widest part of the dental insert, and back far enough to equal the distance from orbital line to distal of molars in the photo of the cast. Insert a pin through points *B* and *B'* and permit print of cast to revolve about this as center, the dental insert passing through the slit *XY*. When the lines *AB* and *A'B'* fall in the same plane, the structures are in their proper relative position. This is shown in Fig. 6, which is a photograph of the combination.

All this is dependent upon the application of Dr. Simon's method and accuracy in photographing.

SOME RESULTS WITH LOURIE HIGH LABIAL ARCH*

By J. W. Ford, Chicago, Ill.

IN preparing this clinic I have constructed six High labial arches, as shown in Figs, 1, 2, 3, 4, 5, 6, 7, and 8. This shows the various types with finger springs as I have used them, but, of course, many additional types of finger springs are used by Dr. Lourie.

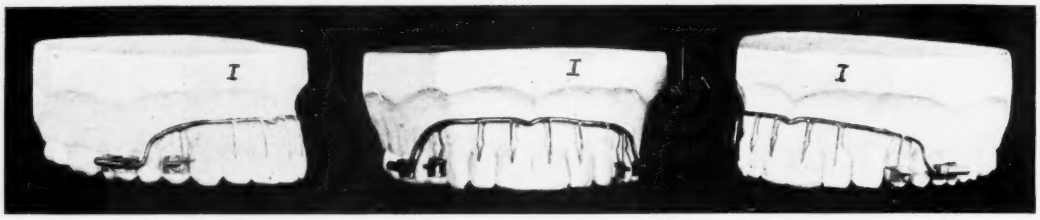


Fig. 1.—Type used in Class II, Division 1 cases. Intermaxillary hooks on first premolar finger springs, which are also being used at the same time for expansion.

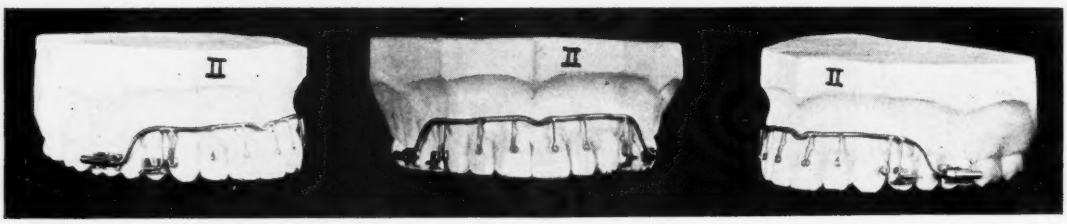


Fig. 2.—Type used in Class II, Division 2 cases. Separate intermaxillary hooks shown mesial to first premolar finger springs. Either type of intermaxillary hooks may be used. Expansion of canines and premolars is controlled by bending ends of spurs, as is shown in occlusal views of appliances I and II in Fig. 4.

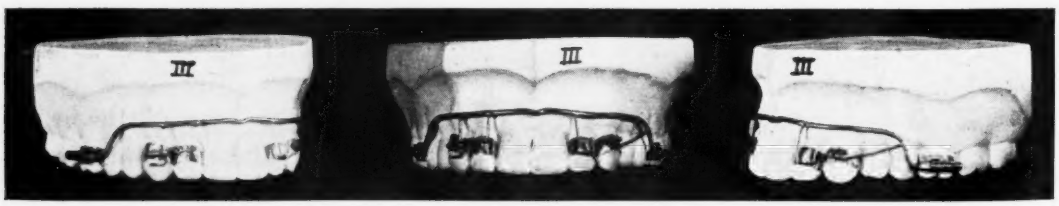


Fig. 3.—Shows type of finger springs to rotate laterals and canines. The right lateral is rotated by ligating from spur on lingual to L type finger spring on labial with eyelet. The left lateral is rotated by means of the J finger spring in tube. Both canines are rotated by means of finger springs in the horizontal tubes. Root movement is obtained on the right canine by means of the extra parallel horizontal finger spring toward the incisal. The finger spring, as shown on the left canine, is also very effective for root movement. In a practical case it would not be advisable to use the left lateral and right canine types of finger springs alongside one another.

The following points should be emphasized:

1. Use a 17-gauge gold platinum wire for the High labial arch base wire. This is important as a smaller base wire is liable to displacement from the

*Clinic given before the Twenty-fifth Annual Meeting of the American Society of Orthodontists held at Atlanta, Ga., April 14-17, 1925.

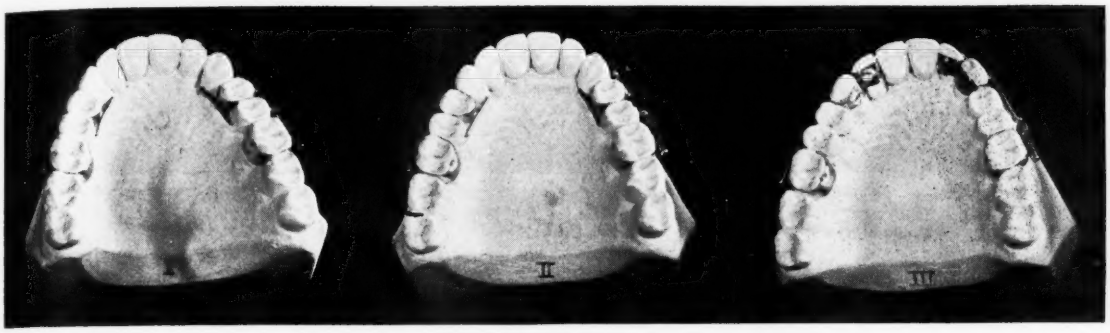


Fig. 4.—Occlusal views of appliances in Figs. 1, 2, and 3.

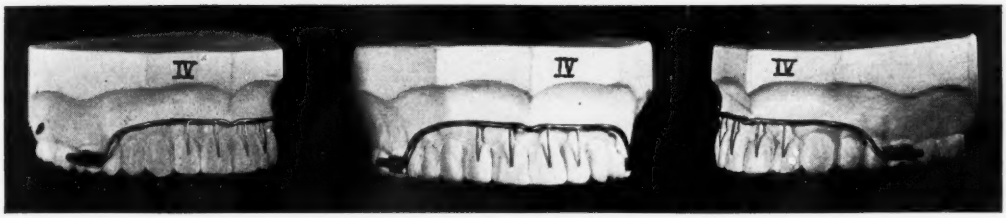


Fig. 5.—Showing method of tipping anterior teeth. The occlusal view of appliance IV in Fig. 8 shows the soldered lingual arch on first molars with fulcrum spurs at the gingival of the anterior teeth.

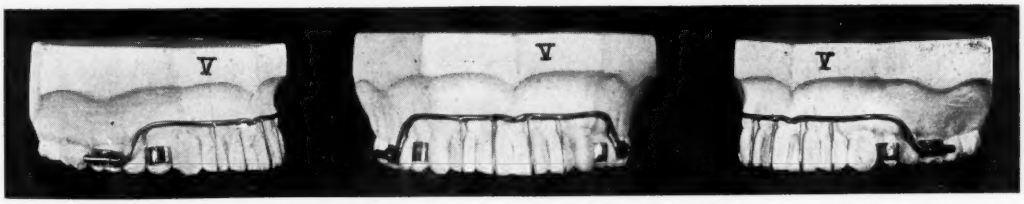


Fig. 6.—Type used to intrude anterior teeth, the ends of the finger springs hooking over the incisal edges. To avoid injury to the incisors or undesirable movement in anchor teeth this movement should be done very slowly. The occlusal view of appliance V, Fig. 8, shows anchorage reenforcement, the soldered lingual arch on the first molars passing above lingual hooks on the first premolar bands. This may be used to extrude the first premolars somewhat as the anteriors are intruded.

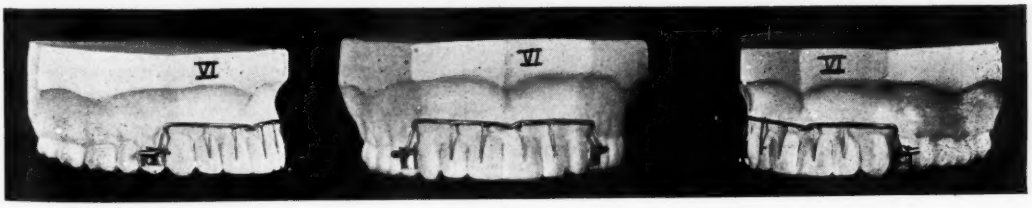


Fig. 7.—Type used where only movement in the anterior region is necessary. Various types of finger springs may also be used on this arch. The type as shown here may be used as a retainer. The occlusal view of appliance VI, Fig. 8, shows the lingual spurs which are to be bent to control expansion.

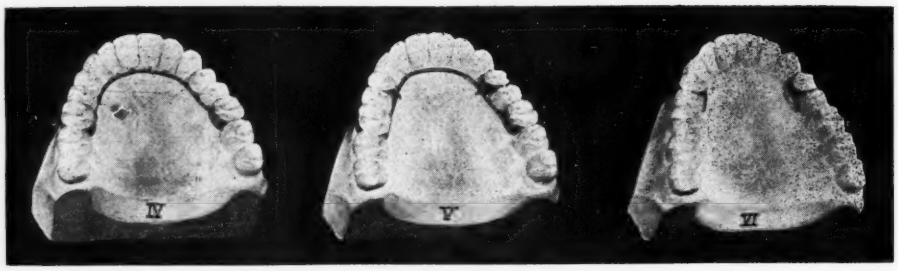
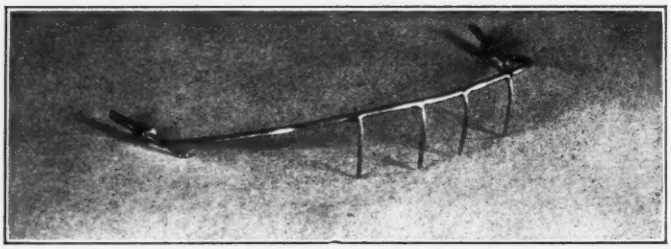


Fig. 8.—Occlusal views of appliances in Figs. 5, 6, and 7.

A.



B.

C.

Fig. 9.—Through the courtesy of Dr. Lourie is shown this appliance block of plaster. *A*. shows the arch with finger springs in place on the block; *B*, arch removed; *C*, block with arch removed.

This may be given to the patient during active treatment when allowed the privilege of removing the appliance for prophylactic purposes or during retention when the appliance is worn only at night. When not in use the patient places the appliance on the block and if it should not fit, he is aware that it has been distorted. If it should be impossible to visit the office, or the patient should happen to be from out of the city, the block and appliance may be sent in for refitting and returned.

action of the finger springs. When a short arch is used, as in Fig. 7, use a 19-gauge iridioplatinum wire.

2. Use 23- or 24-gauge high fusing clasp metal wire for the finger springs.

3. Stabilize the arch in most cases as is done on the first premolars in Figs. 1 and 2. If finger springs are securely ligated to teeth or attached to bands of course we have stabilization of the arch.

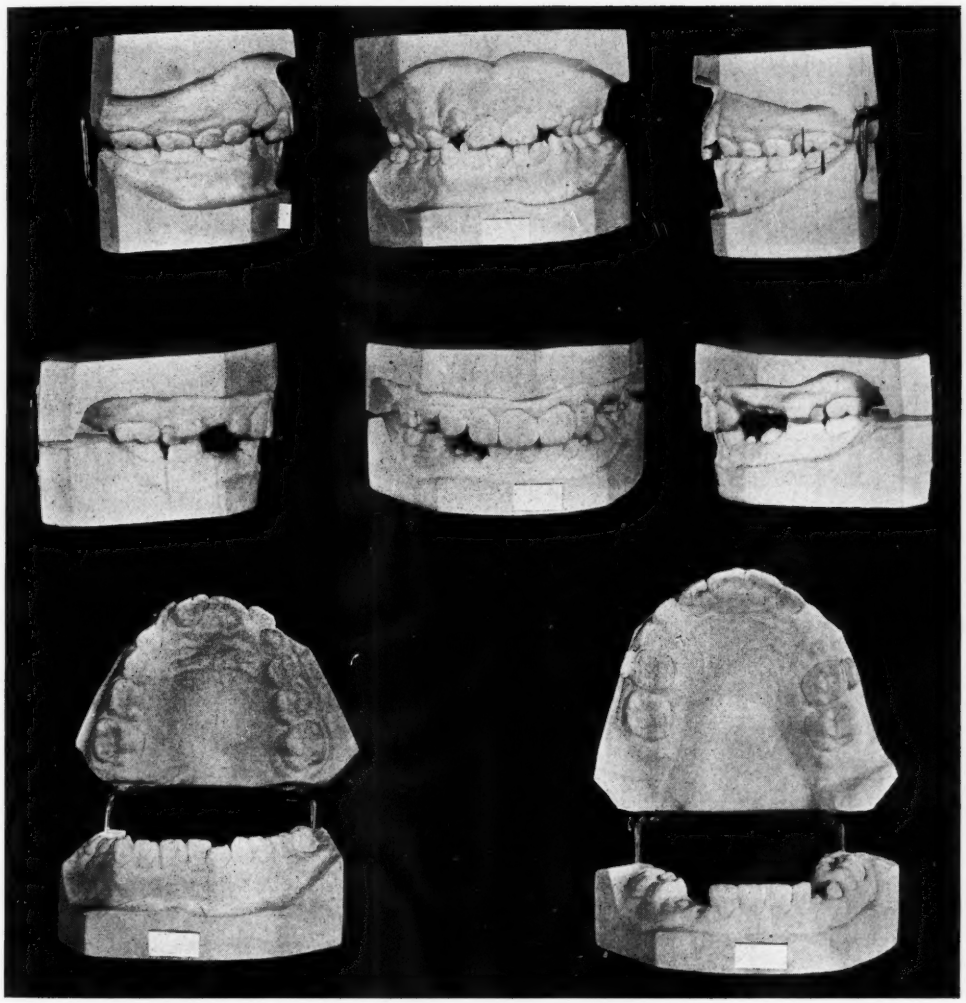


Fig. 10.—Shows case of unilateral distoclusion on left side, before and after treatment. In addition to the anchor bands for the high labial arch the right central and lateral and the left lateral were banded at different intervals, using the J finger springs. An ordinary alignment arch was used on the lower with intermaxillary elastics on left side.

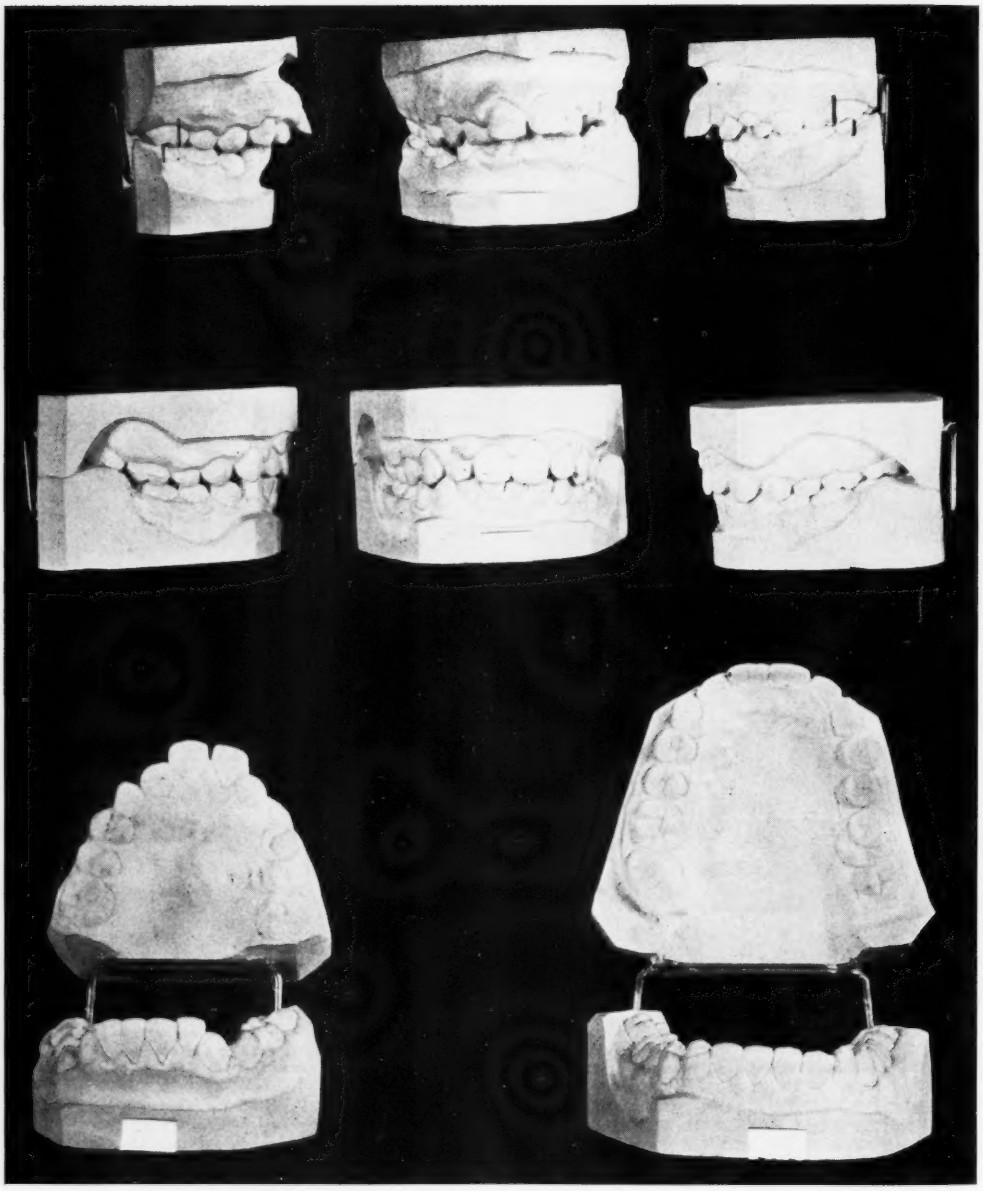


Fig. 11.—Case of bilateral distoclusion. In addition to the anchor bands the first premolars were banded to stabilize arch, as shown in Figs. 1 and 2. The laterals were banded later during treatment to be moved forward. Ordinary alignment arch used on lower with intermaxillary elastics. Occlusal view shows soldered lingual arch on first molars for retention.

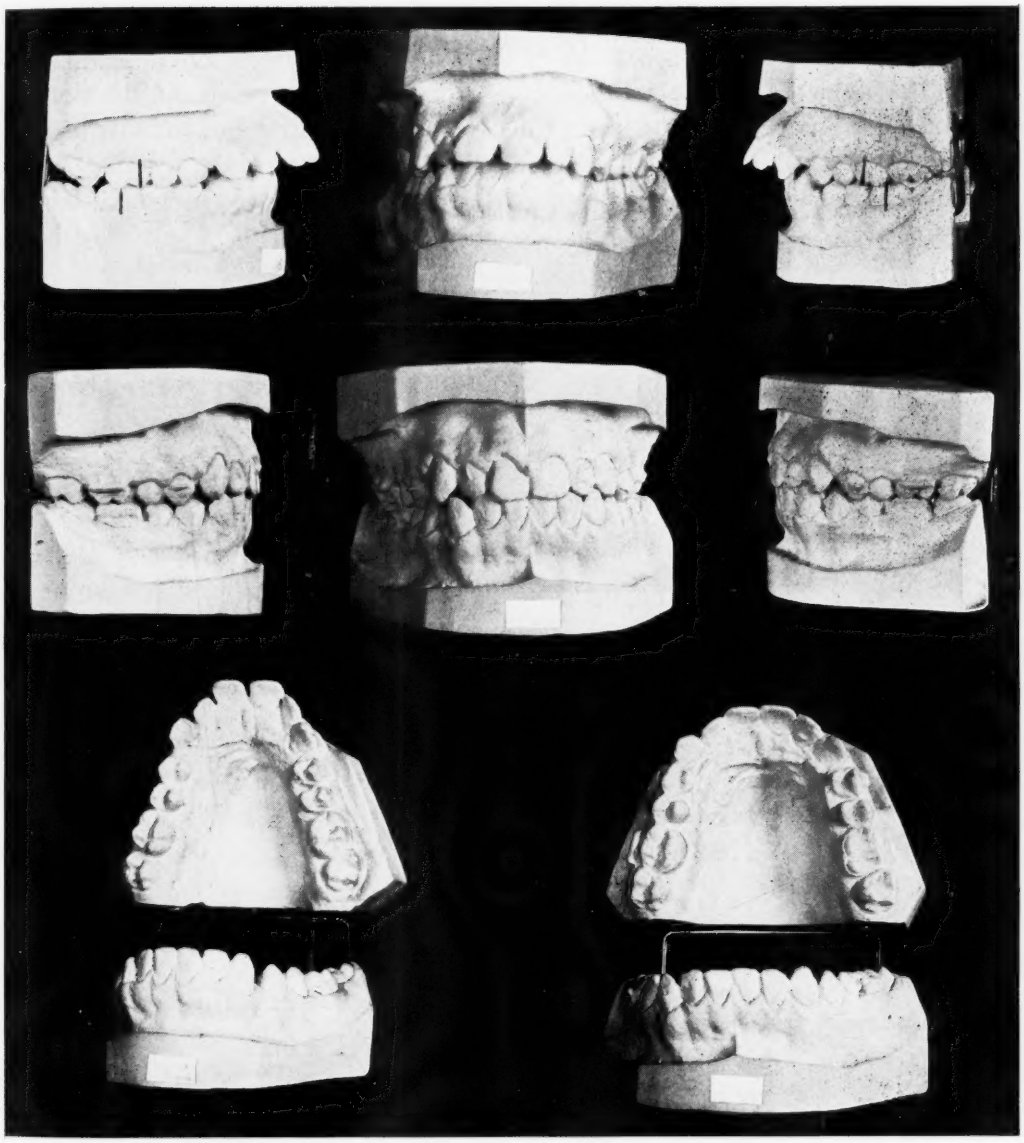


Fig. 12.—Approximately same report as for Fig. 11, except that in this case the laterals were banded for rotating and the appliance not changed for retention.

CLINIC*

By Adelbert Fernald, D.M.D., Boston, Mass.
Instructor in Orthodontia, Dental Department, Harvard University

CASE I, DISTOCLUSION OF CLASS II

FIG. 1-*A* shows a simple method I am experimenting with, of making a chart of the occlusion of a case when treatment is first begun. By using a specially prepared square of celluloid held firmly between the teeth, with the mandible closed normally, I trace the outline of the buccal and labial surface of all the teeth. One hundred of these charts can be filed away in a

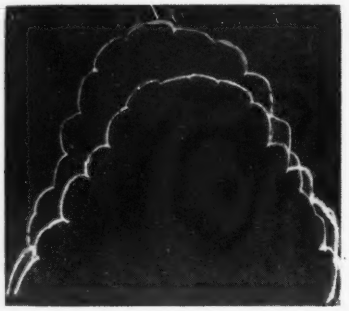


Fig. 1-*A*.

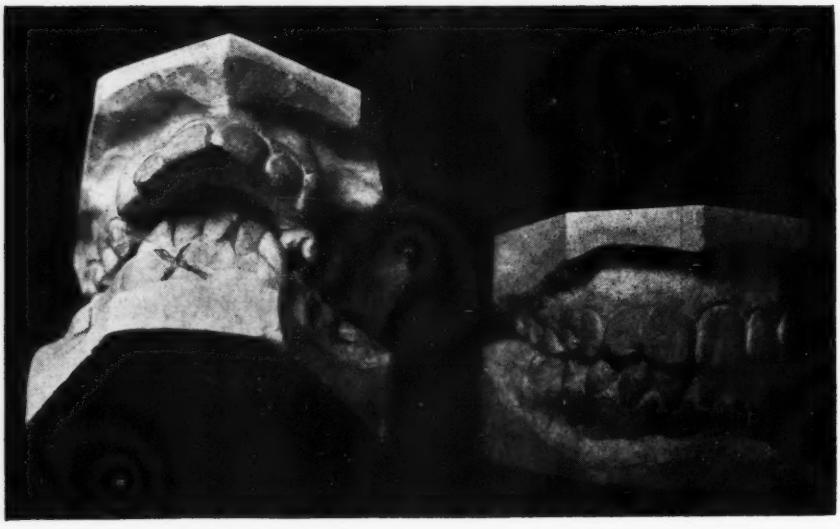


Fig. 1-*B*. Fig. 1-*C*.

three-inch space, with name, date, devitalized or missing teeth noted. In three months I make another chart and by laying one over the other one can see at a glance how much the teeth have been moved and the patient can be shown. By doing this every three months an interesting record can be kept,

*Given before the Twenty-fifth Annual Meeting of the American Society of Orthodontists held at Atlanta, Ga., April 14-17, 1925.

which may be of use long after plaster casts are destroyed. These charts are not to take the place of casts, but will be used with them and other measurements of the face. By measuring chart across buccal groove of one molar to buccal groove of opposite molar and then from the middle of this line to labial surface of anterior teeth, one can tell very nearly what changes have taken place when the measurements are compared with the final charts, at least the measurements will be as accurate in one case as in another. By comparing these measurements with those of models and also with the measurements I take of the teeth and the face with my other instruments, I hope to find out just what changes have taken place during treatment.

Fig. 2-*A*. Fig. 2-*B*.

Fig. 2-*C*.

Fig. 3-*A* illustrates the chart of a case completed, or normal occlusion.

In neutroclusion cases a supplementary chart is made by placing perpendicularly a narrow strip of celluloid lingually and having the patient press same forward firmly with the tongue, while tracings are made above and below. As I said in the beginning, this method is something I am experimenting with, and I cannot tell at present how practical it will be, but I am sure that my technic can be improved. By tracing the lower occlusion in red and the upper one in black, one can observe the deviation between the two lines of occlusion very clearly. A lantern slide can be made quickly by placing the chart between two pieces of glass.

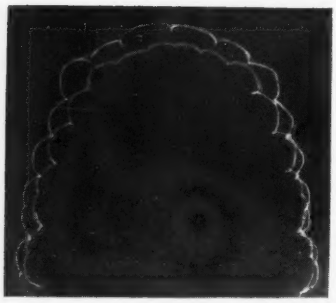


Fig. 3-*A*.

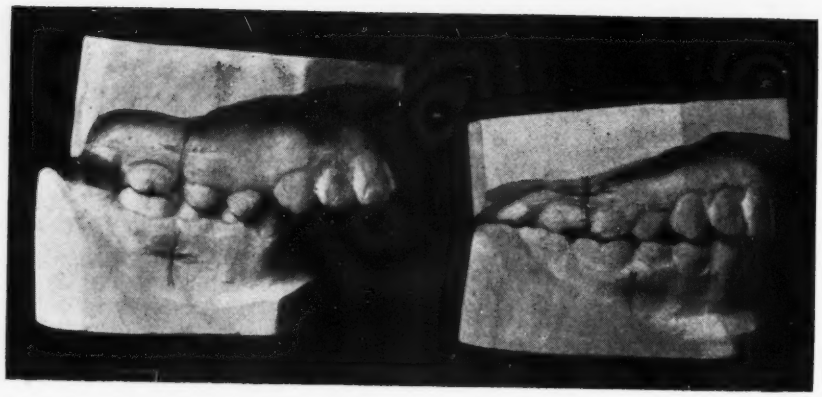


Fig. 3-*B*.

Fig. 3-*C*.

Fig. 3-*D*.

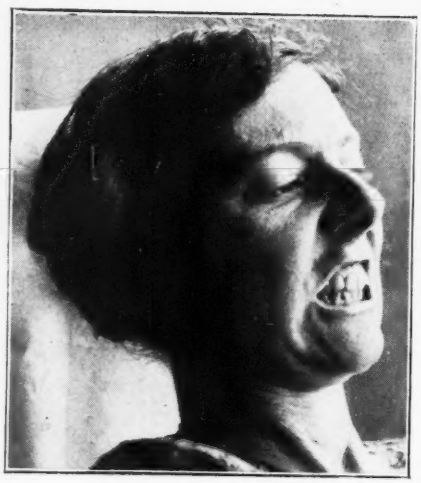


Fig. 3-*E*.

In Figs. 1-*B*, 2-*A* and 3-*B*, models of the patient's mouth at the time she came to me, are shown. This young lady, twenty-six years old, residing in another state about 150 miles away, consulted me in regard to having her teeth extracted and plates made, or having them straightened. Several years before a dentist had extracted the four first molars and the mandibular right lateral.

Fig. 4-*A*.

Fig. 4-*B*.

Fig. 5-*A*.

Fig. 5-*B*.

The posterior teeth came forward closing the spaces, and the force of occlusion closed the space below where the lateral had been removed. The maxillary anterior teeth projected nearly one inch beyond the mandibular teeth. I told the patient I would try and see what I could do to make some improvement but that the case could never be made perfect, as it was already badly mutilated.

She was a public school teacher and was becoming extremely nervous over

the appearance of her face and mouth. She told me she would often see the little children in school point at their teeth and then look at her, she said sometimes she felt as if she would shriek. She was musical, and I suggested that she should practice on a cornet, so as to get the pressure of the instrument against the teeth and lips and to obtain the muscular development which would take place in the facial muscles and the lips in blowing the instrument.

The case responded to treatment immediately. Intermaxillary elastics were used only a short time in treating the case.

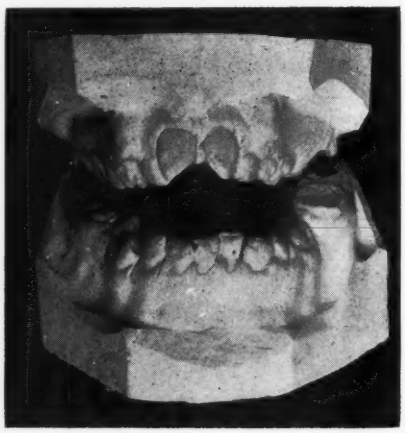


Fig. 6.

Fig. 7.

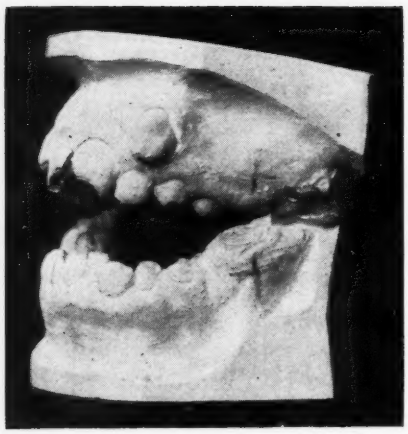


Fig. 8.

Figs. 1-*C*, 2-*B*, and 3-*C* show what changes were brought about in a little less than three years' actual treatment. Although not perfect the patient is very happy over the result, and has given me permission to show her photographs and models whenever I wish.

Fig. 2-*C* shows a photograph of the patient's face with the mouth closed, lips parted, before treatment.

Figs. 3-*D* and 3-*E* are photographs of the patient with mouth closed and lips parted after treatment.

Fig. 4-*A* shows front view of patient with lips at rest, before treatment.

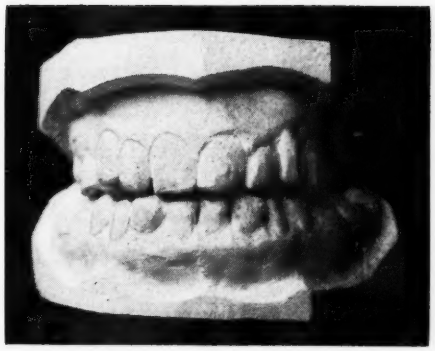


Fig. 9.

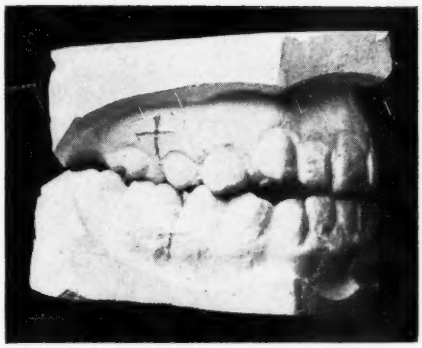


Fig. 10.

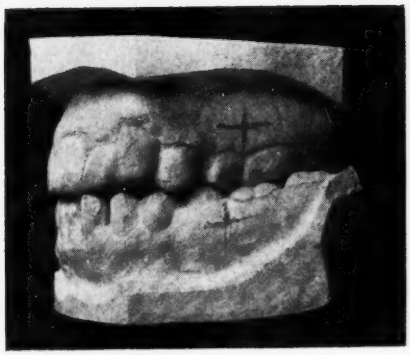


Fig. 11.

Fig. 12.

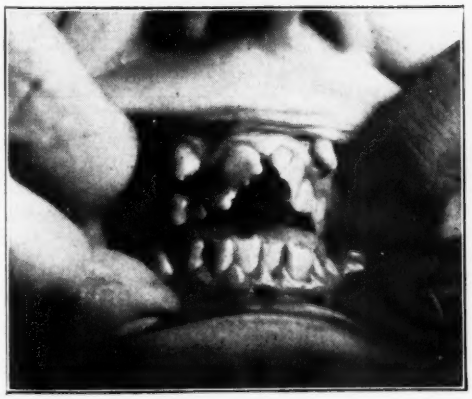


Fig. 13.

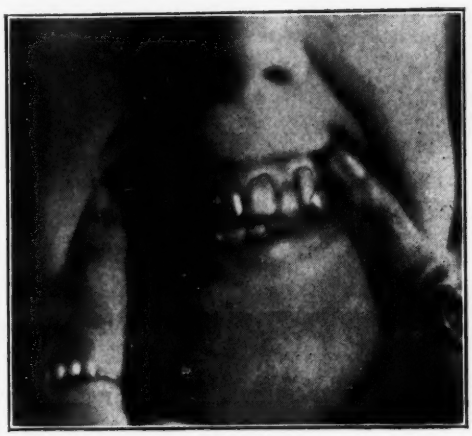


Fig. 14.

Fig. 4-*B* shows patient's face with lips at rest after treatment.
Fig. 5-*A* shows profile, lips relaxed before treatment.
Fig. 5-*B* shows profile of patient after treatment.

Fig. 15.

Fig. 16-*A*.

Fig. 16-*B*.

CASE II, NEUTROCLUSION, CLASS I

Figs. 6, 7, and 8 show a young lady eighteen years old; the four first molars were decayed even with gum. The occlusal third of the maxillary second centrals was affected by some disease in childhood, like measles. All four first molars were extracted, and the centrals restored with porcelain tips. All premolars were moved distally opening up space for the canines and closing up

the space left by the first molars. The mandibular left second premolars had erupted lingually.

Figs. 9, 10, and 11 show the condition of the case two years later.

Figs. 12 and 13 show the condition of patient's mouth at the beginning of treatment.

Figs. 14 and 15 show case at the present time, still under treatment.

INSTRUMENTS

In Fig. 16-*A* is shown an instrument with which I am experimenting. It is designed to measure the different parts of the face, mouth and teeth, before and after treatment. By setting the round dial at zero, measure from the chin to the bridge of the nose, set triangle dial and record the angle of measurement on patient's chart. Do the same in measuring from the maxillary or

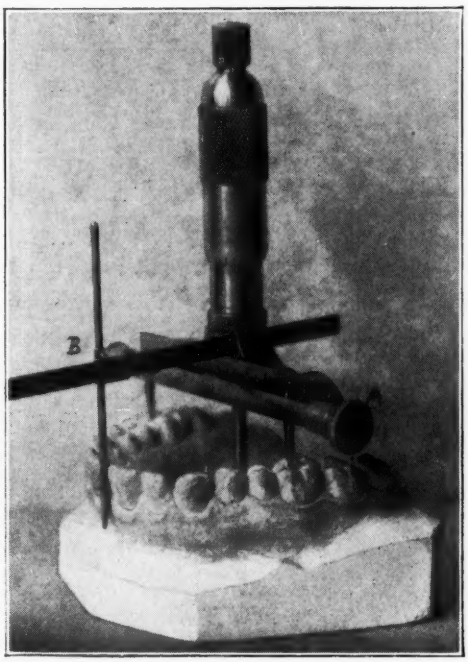


Fig. 17.

mandibular anterior teeth, or for measuring from the highest part of the roof of the mouth. (Fig. 16-*B*.) The different angles of measurement are recorded on the patient's card. Then in three or four months or whenever another measurement is taken in the same place the same angle of measurement for that patient will be used. If after the mouth has been expanded, the roof of the mouth comes down, I think by the use of this instrument I can record the amount of change.

Fig. 17.—Taking the mechanic's depth gage to start with I have added two adjustable points to measure the width of models, which can be opened or closed by turning nut *A* to right or left. By turning handle up or down I can measure the height of the roof of the mouth on the model; by sliding lever at *B* backward or forward on steel gage I can record the anterior position of the teeth. (See Fig. 17.)

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

THE FEDERSPIEL TECHNIC FOR REMOVAL OF ABNORMAL FRENUM*

By A. C. Rhode, B.Sc., D.D.S., Milwaukee, Wis.

THE wide interproximal spaces commonly found between the maxillary incisors are often caused by forces other than the abnormal attachment of the frenum labii superioris. However, this clinic will be concerned with a dis-

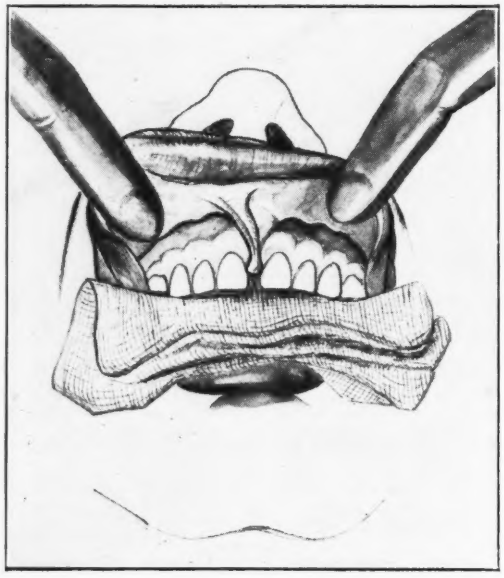


Fig. 1.

cussion of the wide space between the maxillary centrals caused by this abnormal attachment. (Fig. 1.)

In these cases the frenum has grown downward with the growth and de-

*Clinic given before the Twenty-fifth Annual Meeting of the American Society of Orthodontists held at Atlanta, Ga., April 14-17, 1925.

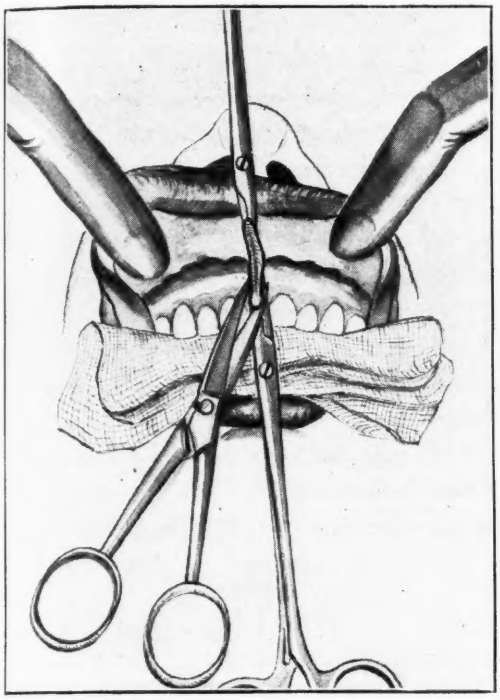


Fig. 2.

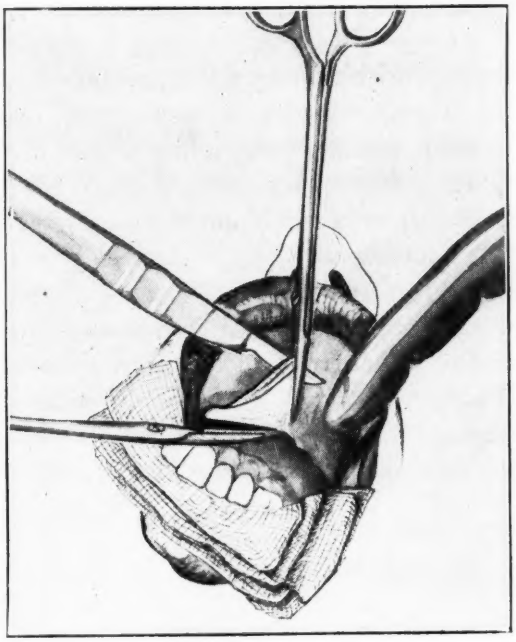


Fig. 3.

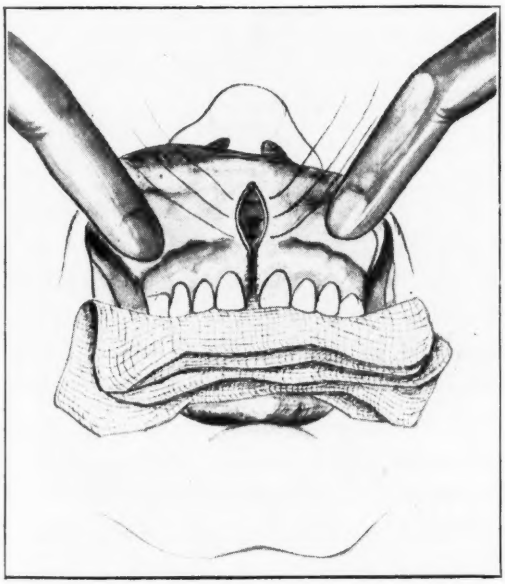


Fig. 4.

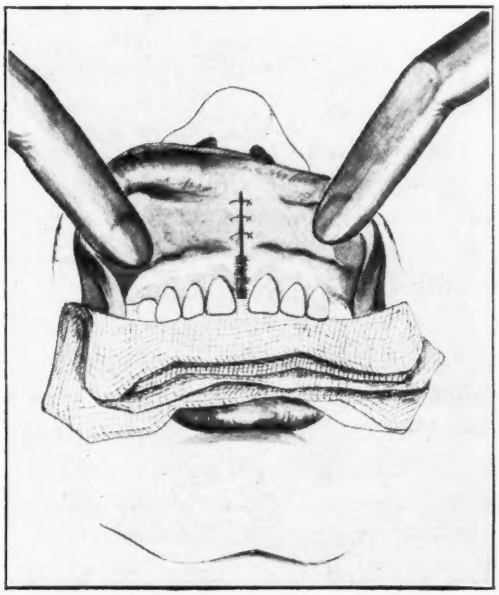


Fig. 5.

velopment of the maxilla and its muscular fibers are not only attached to the gum tissue between the centrals, but usually extend through the interproximal space to an attachment on the lingual aspect. The result is that every movement of the lip causes a contraction of these fibers and the teeth begin to migrate in order to get away from the irritation. A correct surgical technic for the removal of the cause is imperative. It is not sufficient to cut out a *V*-shaped piece of the frenum because when the lip is at rest there may be a

healing together of the raw surfaces, and the deeper located fibers may develop into another frenum.

Under infiltration anesthesia the frenum is grasped, at its connection with the lip, with a hemostatic forceps. Another forceps of the same kind grasps the attachment with the gum tissue. The point at which the two meet in order to form the *V* is very close to the alveolar culdesac, as shown in Fig. 2. A sharp knife is now used to sever the frenum along the beaks of the forceps on the lip side and along the upper beak of the forceps on the gum side. (Fig. 3.) In this way the *V*-shaped piece of frenum is removed clamped in the hemostatic forceps. This leaves an elliptical opening on the inner surface of the lip which is easily closed with a few dermal sutures. (Fig. 4.) The stump of the attachment on the gum side is then cauterized, with the blade of an electric cautery, deep enough to insure the destruction of the deep-seated fibers. (Figs. 4 and 5.) Healing takes place in a few days, after which time the sutures may be removed and orthodontic treatment begun.

SOME EXPERIMENTAL OBSERVATIONS ON THE PHARMACOLOGY OF LOCAL ANESTHETICS

By John A. Higgins, Chicago, Ill.

Ross,[1] Piquand and Dreyfus[2] and others have already called attention to the lowering of the toxic figures from intravenous injections of cocaine or procaine into animals where epinephrin has been added to either of the local anesthetics. The toxicity of butyn is likewise altered from 12 mg. per kg. bodyweight, intravenously in rabbits, without epinephrin in combination, to 9 mg. (or lower) per kg. bodyweight where epinephrin has been added. Fish[3] has published a very interesting article regarding the responsibility of epinephrin (in reactions) when injected in combination with local anesthetics.

Epinephrin salts, unless acid in reaction, are rather unstable. In the body epinephrin is very transient. Unless a dentist is perfectly familiar with the action of varying amounts of epinephrin, complications may set in following an injection with or without a local anesthetic. Sollmann[4] in his text states that, "very dilute concentrations (of epinephrin) may have opposite effects."

Fig. 1 will suffice to indicate clearly some differences in epinephrin reactions that are possible experimentally. Here is recorded a difference in blood pressure from the same epinephrin injected into the same dog in varying concentration. From the first cubic centimeter of a 1 in 10,000 concentration a rise in blood pressure of approximately 56 mm. Hg. was recorded. No fall below the normal blood pressure followed this injection. From the second cubic centimeter of a 1 in 20,000 concentration a rise in blood pressure of approximately 30 mm. Hg. was recorded followed by a fall of approximately 24 mm. Hg. below the normal blood pressure. Other figures of possible interest obtained from varying amounts of the same epinephrin on the same dog are as follows:

Injections	Amt. injected and concentration	Results on blood pressure
1st	1 c.c. of a 1 in 100,000	rise of 14 mm. Hg.; fall of 27 mm. Hg.
2nd	1 c.c. of a 1 in 10,000	rise of 50 mm. Hg.; fall of 17 mm. Hg.
3rd	1 c.c. of a 1 in 200,000	rise of 2 mm. Hg.; fall of 27 mm. Hg.
4th	1 c.c. of a 1 in 2,000,000	rise of 0 mm. Hg.; fall of 8 mm. Hg.

From large amounts of epinephrin, injected intravenously, it is possible to obtain an exceptional rise in blood pressure, followed by a vagus action. The vagus action may or may not lower the blood pressure below normal, or the heart action may fail completely.

Regarding the use of epinephrin with a local anesthetic, it seems questionable whether or not any very noticeable differences, both as to delayed absorption and prolonged anesthesia, are to be had in reality. Experimentally, testing on the rabbit cornea for onset or duration of anesthesia, there seems to be no appreciable difference whether or not epinephrin is added to the local anesthetic. On the other hand the increased toxicity produced by the addition

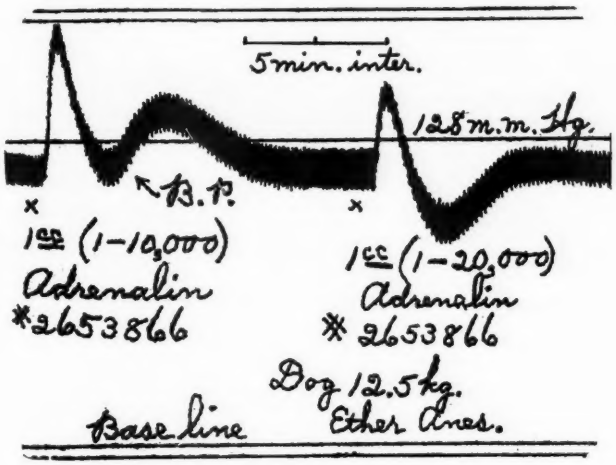


Fig. 1.

of epinephrin would seem more or less to discourage its use. In the use of a hemostatic agent in combination with a local anesthetic the following is of some importance. Does the hemostatic agent employed produce a constriction of the blood vessels (arterioles) by direct muscular action or is the constriction of the blood vessels a secondary action brought about by a primary nerve stimulation? In the latter of these two possible reactions nerve stimulation and constriction of the arterioles may be brought about, but the duration of action cannot exist very long after the local anesthetic begins to get in its action of nerve paralysis.

If epinephrin or a similar body is desired on general principles I might here make a suggestion concerning the use of ephedrine. Ephedrine salts, which have been investigated carefully by Chen and Schmidt,[5] produce physiologic effects similar to those of epinephrin. Its effects are comparable to those of sympathetic stimulation. Ephedrine solutions are very stable even when exposed to light and air and are not decomposed by boiling. The toxicity of ephedrine is relatively low, however, large doses affecting the kidneys and

contents of the urine in rabbits. Ephedrine is claimed to be approximately one-tenth as efficient as epinephrin. Testing the drug on the blood pressure of a dog, the following figures were tabulated:

Drug injected	Amt. injected and concentration	Result on blood pressure
Epinephrin	1 c.c., 1 in 10,000	(primary) rise of 40 mm. Hg.
Ephedrine	1 c.c., 1 in 100	rise of 73 mm. Hg.
Epinephrin	1 c.c., 1 in 10,000	(primary) rise of 42 mm. Hg.
Ephedrine	1 c.c., 1 in 1,000	rise of 30 mm. Hg.

Ephedrine in combination with a local anesthetic (butyn for example) and in therapeutic amounts does not lower the local anesthetic toxic figure when given intravenously in rabbits. Following in intravenous injection of a large amount (10 mg.) or following the injection of a small amount (.2 mg.)

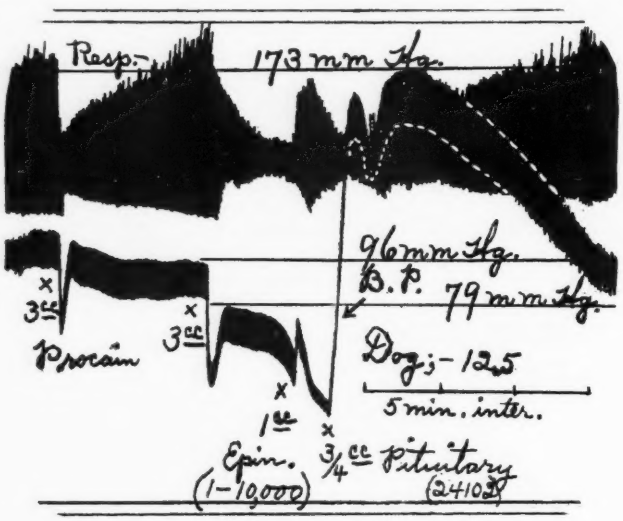


Fig. 2.

of ephedrine, unlike epinephrin, no secondary fall in blood pressure was noticeable.

Attention was called in a previous article[6] to the use of pituitary extract as an antidote in local anesthetic poisoning. Pituitary extract was originally considered of possible value in view of the fact that it acts directly upon muscle structure. We know that local anesthetics paralyze all nerve fibers whether sensory or motor. If the various nerves have been paralyzed by a local anesthetic, further efforts to stimulate the already paralyzed nerves with a nerve stimulant would seem futile. In such cases it has been my object to keep up the blood pressure by direct muscular stimulation of the vessel walls. The experimental results obtained were very satisfactory. Further experimental work has since convinced me that artificial respiration is no doubt as essential as keeping up the blood pressure in overcoming toxic reactions from local anesthetics. Fig. 2 shows how an epinephrin injection proved to be a rather helpless agent in raising the blood pressure following repeated injections of a local anesthetic. An injection of ¾ c.c. of pituitary extract (which

was at least two years old), in comparison, raised the blood pressure considerably and it soon returned to normal. Likewise the respiration became greatly improved without artificial means following the injection of pituitary extract. Fig. 3 again shows how epinephrin compares with pituitary extract and artificial respiration in antagonizing toxic local anesthetic reactions or blood pressure collapse. These experimental results, however, do not agree with the statement of Steel[7] that, "epinephrin given intravenously is the only reliable drug in desperate cases of blood pressure collapse." Further along in his article Steel states, "Various stimulants have been given hypodermically following the spinal injection as prophylactics; notably strychnine, caffein and pituitary extract subcutaneously, and epinephrin intramuscularly: actual blood pressure tests prove them to be of little value." In reply I may state that I question whether any known drug would be beneficial in the case of a desperate local

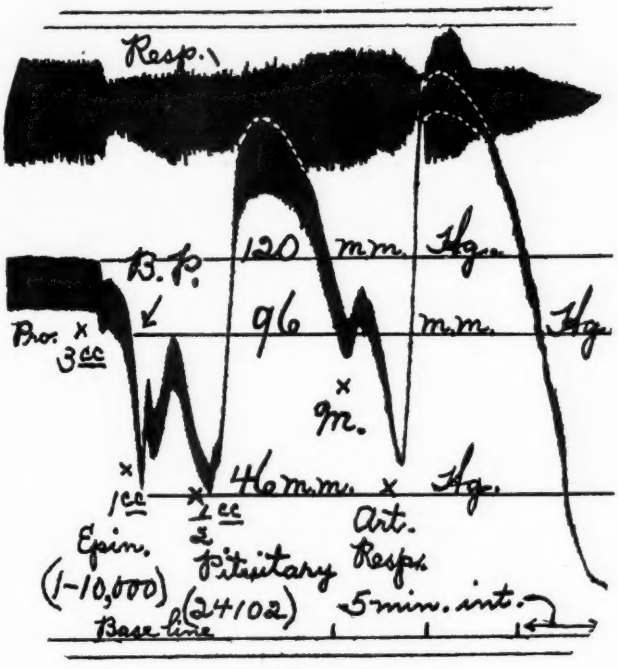


Fig. 3.

anesthetic blood pressure collapse unless the drug, to be used as an antidote, is injected intravenously and not subcutaneously or intramuscularly. The time ordinarily lost in waiting for an absorption from a subcutaneous or an intramuscular injection is no doubt sufficient for a local anesthetic to get in its fatal result. As a matter of fact it has previously been stated[6] that, "Used as an antidote in cases where convulsions have already set in, pituitary extract was effective only when administered intravenously." I might here add that if by previous blood pressure tests the pituitary extract shows indications of containing histamine or histamine-like bodies satisfactory results may not be had from an intravenous injection. The histamine or histamine-like bodies will lower the blood pressure, an occurrence which, in reality, we are trying to avoid. At (*M*) in Fig. 3 I was about to apply artificial respiration by massaging the thoracic cavity walls but finally resorted to the intermittent

positive pressure. It will also be noted in Fig. 3 that, when the artificial respiration was stopped, that the blood pressure fell towards the zero level.

Fig. 4 shows the effect of artificial respiration alone, and at intervals, on the blood pressure of a dog after receiving repeated injections of butyn. It also shows the possibility of keeping the heart going by artificial respiration alone. The results here shown would seem to check up very favorably with the results obtained by Tatum and Atkinson.[8] Although working on cocaine, these authors state, "With artificial respiration the heart would continue to

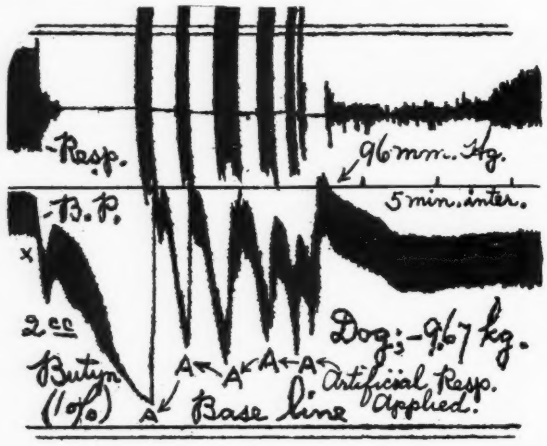


Fig. 4.

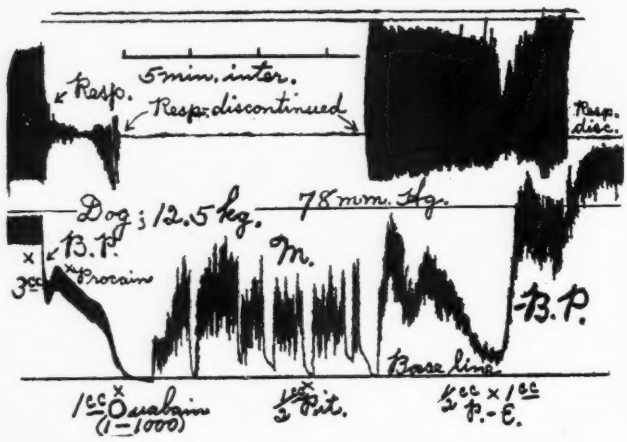


Fig. 5.

beat for from one to four or five hours, the animal apparently dying from central anemia."

Fig. 5 shows the effect obtained by massaging the thoracic cavity walls of a dog after the blood pressure had fallen to the zero level. Simple massaging did not seem sufficient to get the heart beating again so I resorted to an injection of ½ c.c. of pituitary extract. After massaging the chest walls again for a short period the pituitary extract finally reached the heart and brought about its action. A second injection of ½ c.c. of pituitary extract and 1 c.c. of epinephrin was now made. This second injection raised the blood pressure of the dog and maintained it over a long period of time. I am inclined to

believe, however, that the epinephrin had little part in bringing up the blood pressure.

In concluding I wish to call attention to an article by Meeker and Frazer[9] in which these authors mention psychic disturbances as a factor in collapse and shock often ascribed to the local anesthetics. Further along in their article Meeker and Frazer state that "In case of sudden collapse in operations on the throat and neck under local anesthesia, the sudden severe toxic manifestations probably result from an injection directly into the internal carotid or vertebral arteries." Such mishaps are likewise possible in dental operations since it is questionable where the point of a hypodermic needle will terminate.

A case report of what would seem, personally, a typical local anesthetic reaction from a subcutaneous injection, was published in the *British Journal of Anesthesia*.[10] In this particular instance the reaction did not come on until after a sufficient time had elapsed for absorption. When the reaction did come on an important factor seemed to center on the patient's inability to get sufficient air. This case runs about parallel to experimental reactions obtained.

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DEPARTMENT OF
DENTAL AND ORAL RADIOGRAPHY

Edited By
Clarence O. Simpson, M.D., D.D.S., F.A.C.D.,
and Howard R. Raper, D.D.S., F.A.C.D.

THIS AND THAT

By Howard R. Raper, D.D.S., F.A.C.D., Albuquerque, N. M.

THE WRONG ANGLE

LOOK at Fig. 1. Not such a bad-looking radiograph. Rather good, in fact, in the bicuspid region.

Now look at Fig. 2. Not as good as Fig. 1, do you think? It is of the same case. The root outlines are not as distinct. Not as good a radiograph? But wait.

The vertical angle is nearer right in Fig. 2 than in Fig. 1. And what if it is? Well observe the crowned second bicuspid carefully in both radiographs.

One of the main objects in making a general dental radiographic examination is to locate pulpless teeth. Fig. 1 is of a set of radiographs of the whole mouth. The operator who made it failed to discover that the crowned second bicuspid is a pulpless tooth. The operator (Dr. Fred Pettit) who made Fig. 2 reveals this fact by showing a bit of canal filling not visible in Fig. 1 because of the high vertical angle.

Setting the vertical angle is what is commonly spoken of as "tipping the tube." How much should the tube be tipped? For upper teeth, the following rule has long been parrotted: "Let the angle of the x-rays be such as to strike, at right angles, a line bisecting the angle formed by the long axis of the teeth and the plane of the film in the mouth."

A good rule from a mathematical standpoint but impractical from a clinical standpoint. I have long intended to explain and dissect this rule for the benefit of the readers of this Journal. I still intend to, but not now. All I shall say now is that probably not one to the thousand of those who make dental radiographs ever took the bother to even understand the meaning of the rule.

What has happened in practice is this: the operator, learning that a vertical angle which is too low results in elongation therupon shoots 'em plenty

high. That is to say, he tips his tube a lot; he uses a high vertical angle. This causes foreshortening, but what of it, since the radiographs look pretty good (Fig. 1), and one is sure of getting the ends of the roots; and root outlines show even clearer?

The objection to this expedient of shooting 'em plenty high is that we do not get a good or true view of the parts. Abscess cavities may be superimposed on the end of the root and fail to show at all in the radiograph. The view of the alveolar crests and the proximal surfaces is hopelessly distorted. Even rather large pyorrhea pockets may escape detection in such negatives,

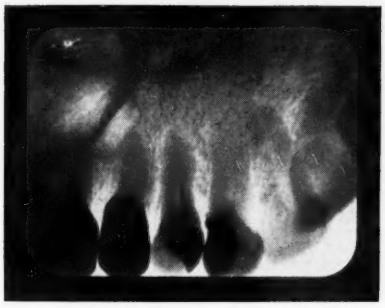

Fig. 1.

Fig. 2.

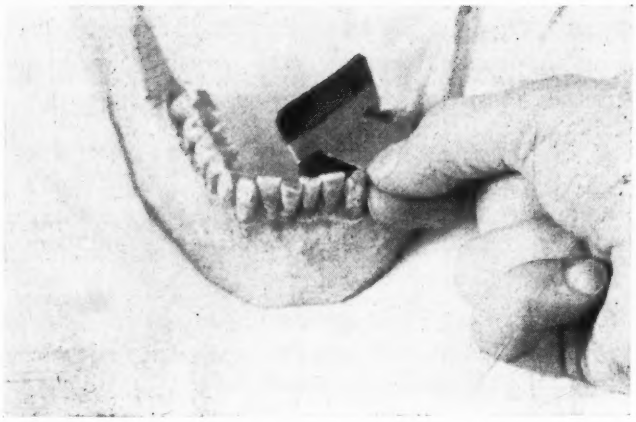

Fig. 3.

and, in the jumble of shadows, other desired information might escape as it escaped the operator who made Fig. 1.

The folly of making observation from a high diagonal angle may be brought home more forcibly to my male readers if they will stop to consider what the view of our young ladies would be from say a window on the fifteenth floor. Viewed from such an angle one might suppose skirts came to the ankles. A view of the dental parts from a proportionally high x-ray angle is no more reliable.

THE OPEN GATE

When I was a boy I had a dog. In those days people had front fences. My dog and I used to take walks together; we "went places." Back of the front fences were other dogs. So the stage is set for a bark-fight. Back and forth, up and down the fence, the dogs raced barking viciously, villainously.

Now the odd and significant thing about these fights (?) is that there were gaps in the fence; palings were off in places and usually the gate stood wide open. The dogs might have gotten together at these points and fought it out to the death, or arrived at some amicable agreement. But they didn't. They raced by the open places, ignoring them completely. Perhaps they were too enraged to see them; or, have it your way, perhaps they liked to bark.

Be that as it may, we dentists, arguing the pulpless tooth question, remind me of the dogs. Up and down the fence we rage ignoring the open gate, the place where we might get together and come to an understanding. Let me point out this open gate, the common ground on which practically all dentists may meet and agree concerning the pulpless tooth:

We can agree, can't we, that a tooth with a vital pulp is a more desirable citizen of the oral cavity than a pulpless one? I think we can. Note, you friends and defenders of the pulpless tooth, that all I have said is that the tooth with the vital pulp is more desirable. If this were not true, there would be no objection to devitalizing teeth before placing a gold crown, and that is a practice abandoned by all. So let me repeat for the sake of emphasis, a tooth with a vital pulp is more to be desired than a pulpless one. The next simple fact is that pulpless teeth can be prevented.

Very well then, if we agree that pulpless teeth are not desirable and that they can be prevented, then in the name of common sense why don't we make it our primary aim to prevent them? Why don't we talk about the prevention of pulpless teeth more, and our methods of monkeying with them less. Or do we have too much fun barking?

WHEN WASHINGTON HAD TOOTHACHE AND NOW

When George Washington had the toothache, he had the tooth extracted. That is the way dentistry was practiced in those days.

Then came the period of "conservative dentistry." People were taught to have their teeth extracted just because they had ached. They were assured that such teeth could be made as good as new. Indeed they were even told that such teeth could be made better than they were before, because "they would never ache again." And this could be done for a trifling amount of money, say a dollar and a half.

The people at large still believe that they are perfectly safe in neglecting their teeth until pulp involvement and toothache occur, and that the treatment required after this is entirely satisfactory and within the reach of all. This, I believe, is absolutely contrary to the facts. Once a tooth has been neglected until toothache has occurred and pulp canal work becomes necessary, that tooth is never as good again no matter how skillful the treatment. (And when it is unskillful—as it so often is—it amounts to nothing more than making the disease chronic, and so, rid of symptoms, letting it go at that.)

As this is written dentistry hesitates, too timid to admit that it cannot make teeth that have ached—teeth requiring pulpal and periapical treatment, I mean—"as good as ever." There is a tendency, in fact, to pretend that of course dentistry can treat such teeth with perfect success and satisfaction.

This, of course, encourages neglect. Why should a person be so all-fired keen to prevent toothache if it can be cured and the tooth made as good as ever?

Dentistry, it seems to me, is under the moral obligation of admitting its limitations. The profession as a whole has no more right to pose as being able to do something it cannot do than has the individual in the profession. And when the individual does this sort of thing we call him a quack. Not that I wish to imply that there is anything deliberately vicious in dentistry's failure to admit its limitations in connection with the treatment of teeth. It is a combination of timidity and natural and entirely justifiable cautiousness.

But it seems to me the admission must be made. Medicine does not hesitate to admit that it cannot treat cancer satisfactorily after it reaches a certain point. Indeed it widely proclaims the fact and organizes societies for the avowed purpose of keeping the disease from getting to the point where treatment becomes doubtful. Ditto tuberculosis. Dentistry is not discharging its obvious duty to the public until it makes similar admissions and takes similar action to prevent pulpless teeth. Not that I am proposing that the treatment of teeth be abandoned. It should not be and never will be. What I am proposing is to give up the silly defense of our treatment. To admit frankly that it is simply the best we can do under the circumstances, but that the circumstance of neglect to the point where such treatment becomes necessary makes entirely satisfactory results impossible.

Was George Washington so far wrong? Answer me this, Mr. Dr. Dentist: a tooth of yours has ached (to your disgrace for allowing it to). Will you now have the tooth extracted, or treated by a dentist whom I shall select for you by shutting my eyes and pointing to a name in the classified list of dentists in the telephone book? And, if you elect to have it treated, what will you have done with it later when you are sick with one or more of the degenerative diseases?

INTERPROXIMAL X-RAY EXAMINATION TECHNIC

The technic for making the interproximal x-ray examination was first published in this Journal. That was over a year ago. Since then the Eastman Kodak Company have manufactured and placed on the market the bite-wing film packets necessary to the making of the complete five-film examination. These are, of course, a great improvement over the crude homemade packets I was using at the time I first described my technic. More experience in the making of interproximal examination has resulted in the development of more exact methods. In brief, the technic for this examination is settling down, becoming simpler and more definite, easier to describe, understand and practice.

What follows now may be considered supplementary to what has already been published in these pages. Some of it is in the nature of repetition for emphasis; some of it is new.

Position of the Head.—The same for all regions. A line drawn from the tragus of the ear to the ala of the nose should be horizontal.

Angle of the X-rays.—The vertical angle should be about 8 degrees above (i.e., tip the tube about 8 degrees) for the posterior teeth. Slightly higher for the anterior teeth, say about ten degrees above.

When determining the horizontal x-ray angle, consider the upper teeth only. (See to it that you get all the surfaces of the upper teeth and you will get the lowers incidentally.) The horizontal angles for a five-film examination are as follows:

For the central incisor region, direct the rays straight through between the upper central incisors.

For the lateral incisor region, direct the rays straight through the upper lateral incisor. If the angle is from too far around on the side—that is too much *mesio*-lingually—the result may be failure to get the distal of the upper central and the mesial of the upper lateral incisor on the negative.

For the posterior region, direct the rays parallel with the mesial surface of the upper first molar. The common mistake will be not to direct the rays *disto*-lingually enough.

Placing the Film Packets in the Mouth.—It is a very great deal easier to place the neat, manufactured bite-wing film packets in position in the mouth than it was to place the cruder, more bunglesome, homemade ones formerly used by the writer. It is, of course, no more difficult to place bite-wing film packets in the mouth for interproximal examination than it is to place ordinary film packets for ordinary intraoral radiodontic work—but it is new and somewhat different and there are certain points in technic which must be learned before it can be done with entire ease and dispatch.

Posterior Region.—Fig. 3 illustrates the several points in technic which will make the placing of posterior film packets simple and easy. Before placing it in the mouth, bend the upper front corner to compensate for the low part of the palatal vault in the anterior region. This bend can be seen clearly in Fig. 3. Also bend the lower front corner slightly; and the other corners may be bent or relieved slightly if desired. This bending of the film packet is not a requirement peculiar to bite-wing film packets. The writer bends ordinary film packets for ordinary dental x-ray work as found necessary or expedient, which is to say, particularly in the incisor and cuspid regions. The theory of the bending is to deliberately bend the film where bending is obviously unavoidable anyhow, in order to prevent unnecessary bending of the entire film and to render the placing of the film easier for both patient and operator.

Place the packet practically in place for the lower teeth—see Fig. 3. Don't let it ride on the tongue; slide it down at the side of the tongue.

Let the front edge of the packet come forward clear into the incisal region. (The common mistake will be not to get it far enough forward.) This leaves a space between the face of the film and lingual surface of the teeth—except the molars. Do not pull on the bite-wing in an effort to close this space.

Let the whole upper part of the packet slant inward toward the median line so that, when the patient closes the teeth onto the bite-wing, it will slide easily into the palatal vault.

Anterior Region.—Crimp the packet a little, if necessary, so that when a pulling force is exerted on the bite-wing it will bend in the middle on a line with the bite-wing. Fasten cotton rolls on the face of the film packet on

each side of the bite-wing. Use medium size Johnson and Johnson, ready-made cotton rolls cut a little shorter than the width of the packet. Touch the cotton roll to water, then to Corega or Wernet's powder, then apply to the packet firmly with a slight rubbing motion. The packet is now ready for use. While it is not absolutely necessary to use cotton rolls, the writer finds it such a great help that he never fails to do so. They tend to keep the film from sliding too far upward or downward.

With the cotton rolls in position, place the film packet practically in position for the lower teeth.

Have the patient bite end to end. If this forces the packet too far downward, bend the upper part of the film backward farther or, in some cases, change the technic to putting the packet practically in place for the upper teeth instead of the lower.

Do not pull on the bite-wing. When the patient is biting on the bite-wing and the film packet is in correct position, only a very little of the bite-wing protrudes labially beyond the teeth.

The old homemade packets with sharp corners required a great deal of bending to avoid hurting the patient and to get them into correct position. With the neat packages with the rounded corners, now available, the matter of bending or relieving at the corners becomes more a matter of personal discussion and option; less a matter of necessity.

Placing the Film Packet in the Lateral Incisor Region.—The writer has lately developed a very simple method of getting the packet in the correct mesio-distal location for the lateral incisor region. Place the packet as though it were for the central incisor region and have the patient bite on the bite-wing, but not tightly. Now move the bite-wing to the side (distally) until the mesial edge of the bite-wing comes to the mesial of the upper central incisors. And now have the patient bite tightly.

Time of Exposure.—The time of exposure for posterior bite-wing negatives is substantially the same as for ordinary posterior dental negatives. Only about one half the time is required for anterior interproximal negatives. For a time the writer made the mistake of overexposing anterior negatives.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Recovery from Ludwig's Angina. W. Hervey (Newark). The Dental Cosmos, March, 1926, lxviii, 3.

Ludwig's angina is a condition which is not often reported in dental journals although it would seem to belong to oral surgery. The author reports a case with recovery after having lost two patients with this malady during his career as a dentist. The patient was a robust man with sound teeth and mouth. The condition at the time of admission was diagnosticated as a sublingual abscess and suppurative cellulitis, with pus pointing externally in the neck below the mandible to the left. After the use of an ice collar for some hours without much relief it was decided to drain the pus although the temperature was not high. A double incision was made, the pus withdrawn and drains inserted. The temperature however began to go up, to nearly 104, although the blood remained sterile. The swelling did not subside and breathing became increasingly difficult. Treatment was entirely symptomatic and the author expected to lose the patient, but he held his own and by the fifth day improvement was noted and was continuous. One point of interest has not been mentioned, that under the ether anesthetic the respiration and pulse stopped for the time, rendering artificial respiration necessary. Confronted by a similar case he would not dare to make use of a general anesthetic but would adhere to local or conduction anesthesia. The recovery is ascribed by the author to persistence with hot fomentations and to stimulation of the heart. The author makes no mention of gangrenous cellulitis, which according to some authors is always present in Ludwig's angina, necessitating openings large enough to give exit to the necrotic tissue. The wound cultures showed only a streptococcus and no gas-formers present. Apparently cases like the author's show that we may have clinical Ludwig's angina without gangrenous cellulitis.

Can People Be Immunized Against Pyorrhea? W. R. Hughes (Oakland). The Pacific Dental Gazette, February, 1926, xxxiv, 2.

The author analyzes pyorrhea as follows—irritation of very many types makes possible bacterial growth on the surfaces of the teeth which in turn sets up the disease. The original irritation is still present. The gums are

involved and the bacteria invade them, the supports of the teeth are weakened and bacteria invade the broken down margins. The author however is not interested in the possibility of making the patient immune to bacterial invasion but refers in reality to building up the patient's resistance. He would attempt to secure harmonious relation in occlusion, and at the same time remove all irritation due to prosthetic apparatus. Mouth hygiene should be carried out to extreme lengths and diet should be balanced. The factor to which the greatest attention is paid, however, is the prevention of false contacts which the author separates completely from occlusal troubles. Many factors under this head come into play in early life. Since a patient will not bite on a tooth decayed on its occlusal surface all caries should be treated at an early period. Early extractions should be followed by some kind of substitutive prosthesis. It should be impossible to drive food into embrazures to injure the gum. All bad mouth habits should be abolished, as holding professional implements between the teeth. But the distinction between faulty occlusion and faulty contacts is puzzling to any but orthodontists, for while the habit of holding brushes in the teeth is put down under contacts, that of holding the pipe in teeth is placed under occlusion. It would seem to be practical to consider contacts and occlusion under a common head.

Mouth Fetor. H. Jugel (Berlin). Zahnaerztliche Rundschau, Jan. 17, 1926, xxxv, 3.

A man of forty-five presented himself with toothache and bad breath associated with digestive troubles. The only point in his history to have any significance was the loss of his left eye which had been enucleated for tuberculosis. The author, who is a medical practitioner, made a thorough examination and found by means of the röntgen ray an ulcer of the greater curvature of the stomach. The teeth and tonsils were alike badly infected and there was a smoker's catarrh. The teeth were put in order and the tonsillar recesses relieved of the infected plugs. In this case the fetor of the breath might have come from the stomach, throat, teeth or elsewhere. If from the tonsils expression of the plugs usually does away with the bad breath for the time although a relapse may be expected. Should the tonsillar crypts fill up again he would order removal of the tonsils. The odor in bad breath cases usually suggests decomposition, which in turn suggests stagnation somewhere. Any kind of stomatitis is accompanied by fetor athough stagnation is not necessarily present. Stagnation takes place of course in cavities, spaces between the teeth, gum pockets, etc., and such retention is usually readily detected and the causes removed. If the bad odor comes from the stomach there should be acute or chronic dilatation of the organ with stagnation and decomposition of the contents. Unless certain gases are given off and escape from the mouth the breath should not be tainted from this cause. The two gases most likely to be malodorous are hydrogen sulphide and mercaptan. Fetor from the stomach should disappear if the organ is washed out. Some of the worst cases of fetid breath come from the lungs and bronchi but in this patient the chest organs appeared to be in good condition. Chronic metallic poisoning could also be excluded.

Nephritis Due to a Focus of Pus Beneath Two Milk Teeth. P. Gadd (Helsingfors). Zahnaerztliche Rundschau, February 21, 1926, xxxv, 8.

The patient was a girl aged sixteen who presented a fever without any other symptoms. She emaciated considerably from lack of all desire for food and was moved to a sanitarium, where a consultation was held, in the course of which the author had his suspicions directed to the gum, probably owing to a recent history of a swelling, which however had now subsided. Careful examination failed to show anything wrong and a roentgen plate was then made. While most of the permanent teeth were present there was defective development of several of these and two milk molars were still persistent. The patient at the time was wearing an expansion brace. The author decided to extract one of the milk molars on general principles, which having been done under ether he was rejoiced to see the escape of pus from the extraction wound. The temperature at once fell. In the meantime the report from the medical clinic showed that an infectious nephritis had developed, due to the presence in the blood of the bacillus coli, which is known to be a common denizen of the mouth. As the fever returned the author concluded that another infected tooth required removal and proceeded to extract the opposite milk molar. There was but a drop of pus but the roots had been absorbed and a granuloma was present. Again the temperature dropped and the patient was placed on an intensive treatment for nephritis—rest in bed, liquids and urotropin. At last accounts the urine was clearing up. The author attributes the infection of the kidneys to the tooth first extracted, rather than the second one.

Bleeding from the Tongue and Gums in Polycythemia Rubra. A. Chaim (Berlin). Zahnaerztliche Rundschau, February 7, 1926, xxxv, 6.

While much has been written of late concerning the buccal symptoms of pernicious anemia little if anything has been said in dental journals of such symptoms in the opposite condition of polycythemia. Clinically this condition is a chronic cyanosis with increase in the count of red cells over normal and enlarged spleen. This state of plethora is responsible for such symptoms as headaches, vertigo and tinnitus aurium, while hemorrhages from the various mucous membranes are common, including those of the gums. This disease is not new for Vaquez mentioned it as far back as 1892 and Osler gave it a good description in 1903, so that it is familiarly known as the Vaquez-Osler disease. In 1905 Gaisbock described a special form of this affection which is limited to the peculiar blood count, the spleen being normal. Dr. Chaim describes the following case in a man who had suffered from earliest childhood with rush of blood. All the men in his family are large and florid and at least one sister seems to have suffered from the same symptoms as the patient, while the latter has a fifteen-year-old daughter with bleeding gums and loose teeth. The patient himself, now fifty-six suffers from burning in the tongue off and on, the paroxysms being violent, but relieved by sugar held in the mouth. This was a symptom of very late origin which incidentally forced him to give up smoking. He feared cancer of the tongue and hence sought treatment. On examination his gums were found to bleed while the tongue presented a fissured ap-

pearance. Blood pressure 200 Red cell count 9,500,000 or about double the normal. The condition being a true plethora of the ancients the patient was bled several times with remarkable improvement, although this could be only temporary. There was enlargement of the spleen.

Is the Adenoid Facial Type New? Editorial. The Dental Surgeon, February 20, 1926, xxiii, No. 1112.

Sir Harry Baldwin, surgeon-dentist to King George V, who has compared many of Sargent's portraits with those of the Tudor period, declares that the so-called adenoid type of face, so familiar to the dentist, is a product of the last hundred years only. The characters of this facial type are its narrow-arched jaws, pinched-in nose and inadequate nostrils. He suggests that it may be due to deficiency in vitamin-B through the excessive use of modern white bread. The editor of the *Dental Surgeon* suggests that there may be another factor which inheres in white bread but has nothing to do with vitamin content, this being the softness, not only indeed of white bread but of most of our other foods. This softness has led to a disuse of the muscles of mastication and defective development of the bones involved. In passing, the editor alludes to a theory of adenoids quite at variance with the preceding—that they have resulted from the modern habit of sleeping with open windows which in a damp climate is of doubtful value. No doubt the adenoid face, if it is modern, is due to a number of factors involved in our present day rapid social evolution.

True Tetanus with Eruption of a Wisdom Tooth. K. Bettsack (Munich). Zahnaerztliche Rundschau, February 21, 1926, xxxv, 8.

Simple mechanical lockjaw occurs to some extent in difficult eruption of the lower wisdom teeth but the following case appears to have been an example of true tetanus. The symptoms began with some sore throat and inability to open the mouth but these manifestations abated. When the author first saw the patient there were no serious symptoms beyond those ordinarily present in difficult dentition of a third molar and he contented himself with cleansing the gum socket and prescribing a wash. The patient did not return and the author learned that he was in the hospital for tetanus. He was summoned in consultation, for the surgeon could find no port of entry for a lockjaw germ, unless it should prove to be connected with the erupting tooth. The patient improved immediately under antitetanus serum and after his recovery consulted the author for caries in the tooth in question. The author thereby had an opportunity of obtaining a history as follows: When the tooth first began to cause unpleasant symptoms the patient was planting potatoes and frequently felt of the tender gum with a finger soiled by garden earth, which is noted for harboring tetanus bacilli. In thus doing he could readily have inoculated the abraded surface of the gum with the latter.

Fatty Degeneration of the Pulp. H. Willner (Breslau). Deutsche zahnaerztliche Wochenschrift, February 12, 1926, xxix, 3.

This condition has only recently obtained recognition as a separate type of degeneration of the pulp. Preisswerk first mentioned it in his textbook in

1903 but little attention was paid to it. In 1924 Euler took up the subject exhaustively and calls attention to the fact that this form of degeneration may occur in normal pulp as well as in chronic pulpitis. Weber has recently widened our knowledge of the subject still further, while the author has made extensive studies including a series of 100 teeth comprising normal and numerous forms of pathologic teeth. A normal tooth taken as a standard showed only a trace of fatty degeneration in the processes of the odontoblasts while in two retained wisdom teeth the entire pulp was fatty, the degeneration in the odontoblasts being intense. Localized fatty change is seen in dentin caries and other affections while in acute pulpitis the leucocytes, especially the polynuclears, show intensive degeneration. In chronic pulpitis the leucocytes almost always show the same condition. The author's contribution to this subject is only a preliminary one and he comes to no conclusions as to the meaning of this form of degeneration. Apparently it is almost universal to some extent and in practically every dental disease or lesion there is some degeneration of the pulp. This condition may prove to be an index of the vitality of a given tooth or rather of its pulp while fatty degeneration of cement cells may be responsible for lowered vitality of cement of which much is nowadays said.

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EDITORIALS

Honorary Degrees and Their Abuse

IT HAS long been the custom of universities and colleges to grant honorary degrees for various reasons. In some instances, the reason has been an endowment, and, knowing such a procedure to be customary, certain individuals have made donations to schools, not to further education, but to obtain a degree. In other instances universities have granted degrees to men who have contributed to the advance of science; such recognition is honorable and just, but these men, however, are forced to see the same degree commercialized. It is conferred upon another man for a monetary contribution, the donation of a dormatory or a laboratory.

We have also known men who have received degrees simply through influence of a friend on the Board of Trustees. There are men in the dental profession displaying honorary degrees which have been received in just this manner.

Men of the dental profession who are using the honorary M.D. after their names are unjust both to the public and to the profession. A few years ago it was customary for certain medical schools to grant honorary degrees for trivial services—a few lectures were delivered to students and in return the man received an honorary degree. After receiving the degree in this fashion the dentist would proceed to have the M.D. added to his name on his cards and stationery and in Polk's Dental Directory. Of course in some instances a dentist may have attained a position in the profession which would justify the medical school in giving him an honorary degree. Very few of these men, however, have ever informed the public or profession that the degree is honorary and not one earned by following a prescribed course of study, as a few men in the dental profession have honestly earned an M.D. degree.

The large diploma and degree business of the Oriental University of Washington, D. C., which has recently been declared fraudulent by the government, has brought the injustice of honorary degrees to our attention. An investigation of their records showed that several men in the dental profession were using M.D. degrees obtained from that institution. While most of these men were rather obscure, we found the names of several prominent men in the dental profession, national figures, with honorary M.D. degrees from the Oriental University and institutions of questionable standing.

The honorary degree has no standing before a medical board, so the public does not suffer a great deal from the promiscuous granting of degrees; but these men do have the degrees on their stationery and pose, to the public at least, as having greater knowledge than those who possess only a D.D.S. degree. In other words, these men are claiming to have a knowledge that they do not possess. This is an injustice to their professional associates who have followed a definite line of instruction for the purpose of obtaining a degree in a legally qualified manner.

A few years ago it was customary for dental schools to grant an honorary D.D.S. degree for various reasons, but some schools granted so many that the American Association of Dental Schools passed a resolution whereby, "no dental school can grant an honorary degree unless it is sanctioned by all other schools of the association." As a result of this the honorary D.D.S. became very hard to obtain. We know of a few men, however, who have been clever enough to obtain this degree and who now display it in such a manner that the majority of the profession believe it to be legitimate, whereas their association with dental education consisted in walking in one door and out the other.

We hope that the granting of various honorary degrees will be discontinued for the good of the profession. The men who are entitled to the honorary degrees do not need them, and the others should not have them.

Dr. Wilson Foster

Dr Wilson Foster, a resident of Cincinnati for twenty-one years, died at his home Sunday, January 24, 1926. His sudden death, following an operation for complications of the gall bladder, was a great shock to his many friends and coworkers.

Dr. Foster began the study of orthodontia at the Angle School of Orthodontia in 1904, and practiced his chosen specialty from that time. He was a graduate of the Ohio Dental College, and a member of the Ohio Dental Society, the Cincinnati Dental Society, the American Society of Orthodontists, the Rotary Club, the Business Men's Club, the Hyde Park Country Club and the Kenton Commandery of Masons, Kenton, Ohio.

He is survived by his widow, Harriet B. Foster, and two daughters, Isabella and Margaret.

The profession feels the loss of a man of fine character as well as a valuable worker, and the sympathy of all his friends is extended to his wife and family.

Burial services were at Kenton, Ohio.

ORTHODONTIC NEWS AND NOTES

First International Orthodontic Congress

The First International Orthodontic Congress will be held at the Hotel Commodore, New York City, August 16 to 20, 1926.

Membership blanks and further information can be obtained by writing to Dr. William C. Fisher, President General, 501 Fifth Ave., New York, N. Y., or Dr. Walter Ellis, Secretary General, 397 Delaware Avenue, Buffalo, N. Y.

Seventh International Dental Congress

The Seventh International Dental Congress will be held in Philadelphia, Pa., August 23 to 27, 1926.

Southwestern Society of Orthodontists

The 1926 Session of the Southwestern Society of Orthodontists will be held in Houston, Texas, July 31 to August 3, 1926. For further information write Dr. P. G. Spencer, Secretary, Amicable Bldg., Waco, Texas.

The Dental Society of the State of New York

The fifty-eighth annual meeting of the Dental Society of the State of New York will be held at the Hotel Astor, New York City, May 19, 20, 21 and 22, 1926.

The literary exercises, clinics and exhibits will be held at the Hotel Astor. Dr. A. C. Bennett, 576 Fifth Avenue, New York City, is chairman of the Exhibits Committee, and those desiring space should communicate with him immediately. Dr. Frederick R. Adams, 8 West 40th Street, New York City, is chairman of the Clinic Committee.

Every effort is being put forth to make this meeting one of the most attractive in the history of the Society. Reduced railroad rates have been secured for this meeting.

A cordial invitation is extended to all ethical practitioners. Admission to the literary meetings and clinics may be secured by registering and presenting membership cards in the State or National Societies. Headquarters will be at the Hotel Astor and Reservations should be made direct with the hotel management. For further information and programs address A. P. Burkhardt, Secretary, 57 East Genesee Street, Auburn, N. Y.

Ontario Dental Association

The Annual Convention of the Ontario Dental Association will be held at the King Edward Hotel, Toronto, May 17 to 20, 1926. An excellent practical program has been arranged. Dentists from points outside Ontario are cordially invited.

Resolutions Presented by Dr. Delabarre and Adopted by the New York Society of Orthodontists, December 9, 1925

WHEREAS: Many cases of Malocclusion are seriously complicated by avoidable physical dental defects early in life: and

WHEREAS: Orthodontists would welcome the elimination of all such complicating causes: and

WHEREAS: It is believed that the best possible future development of Dentistry must be along the applied principles of Prevention:

BE IT RESOLVED: That the New York Society of Orthodontists make this unanimous appeal to the Dental Profession at large to use all their influence to bring about as speedily as possible the consummation of such development, through individual effort and the adoption of a revision and balancing of Dental Curricula that will emphasize the teaching and practice of Pediodontia.

Resolutions Presented by Dr. Hyatt and Adopted by the New York Society of Orthodontists, March 11, 1926

WHEREAS: One of the greatest problems of Pediodontia is the preservation of the permanent teeth that make their appearance early in life: and

WHEREAS: Almost 100 per cent of the carious-cavities in the occlusal side of molars and bicuspids start in the lines of coalescence, known as developmental grooves: and

WHEREAS: When a fissure or fault is found along the line of coalescence its presence is a serious menace to the integrity and permanency of the tooth: and

WHEREAS: The greatest danger to the tooth in occlusal caries lies in the fact that rapid destruction of the tooth substance takes place under the enamel along the dentio-enamel junction: and

WHEREAS: This destruction can attain large proportion before showing external evidence: and

WHEREAS: It is known that even superficial caries will cause pulp irritation: therefore be it

RESOLVED: That the New York Society of Orthodontists approves and endorses the principle of early protective treatment of non-carious occlusal fissures in molars and bicuspids as soon as possible after the eruption of these teeth.

Notes of Interest

Dr. Harvey A. Stryker announces the removal of his office to 1101 Medico-Dental Building, 8th and Francisco Streets, Los Angeles, Calif. Practice limited to orthodontia.

Dr. William W. Woodbury announces the removal of his office to 70 Spring Garden Road, corner South Park Street, Halifax, N. S. Practice limited to orthodontia.

Harry E. Abelson announces his location at 17 Park Avenue, New York, for the practice of orthodontia.

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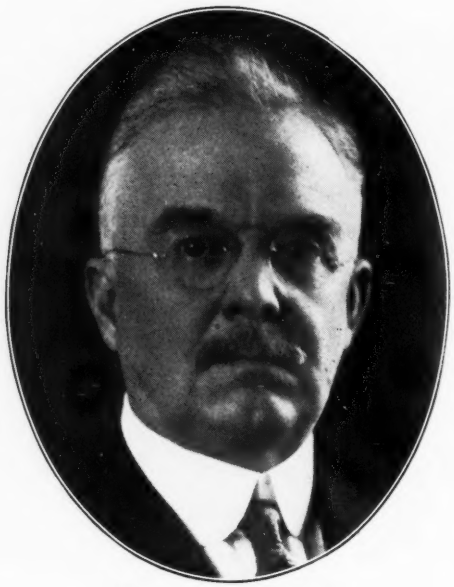
New York City
President-General
First International Orthodontic Congress

WALTER H. ELLIS
Buffalo, N. Y.
Secretary-General
First International Orthodontic Congress



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